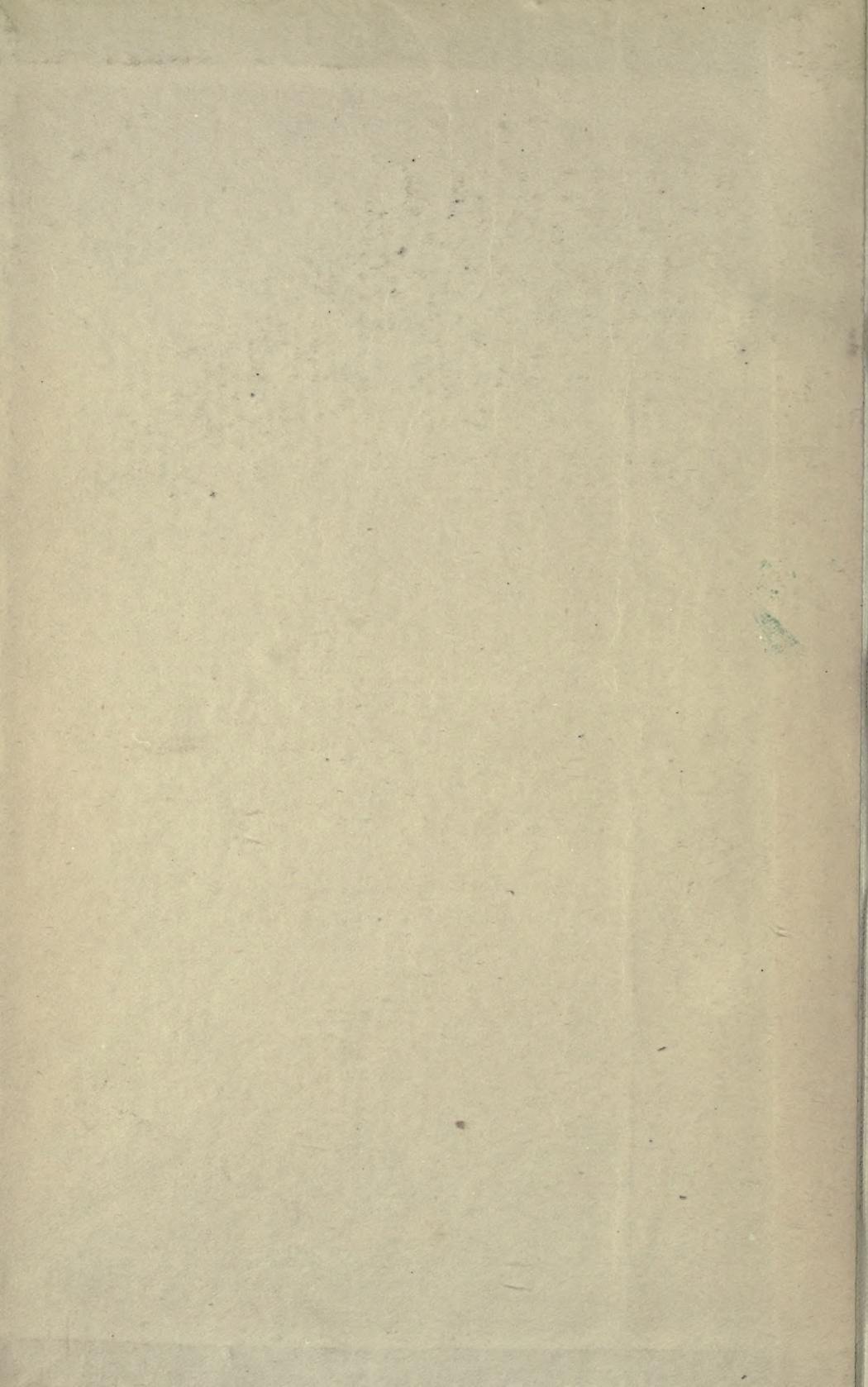
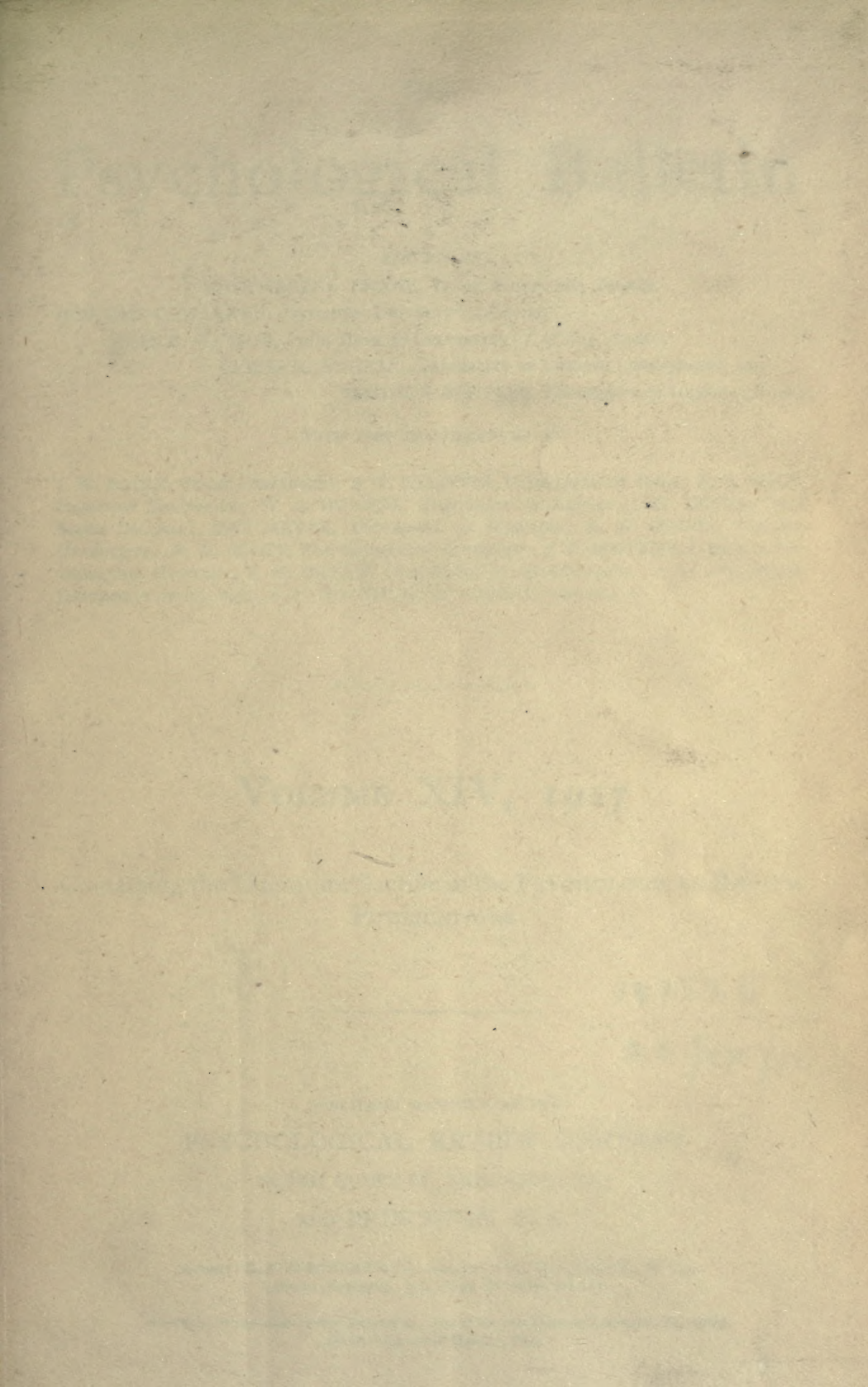
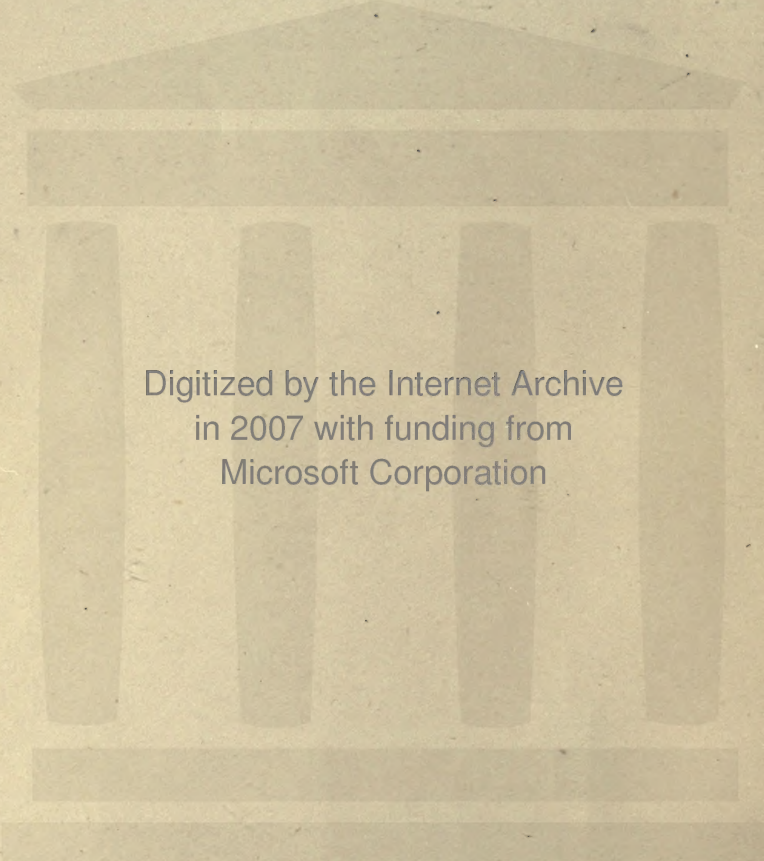


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THE Psychological Bulletin

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THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

HISTORICAL CONTRIBUTIONS

BY WOODBRIDGE RILEY

Vassar College

The French necrology includes François Pillon, founder of *L'Année Philosophique*, Jean Henri Fabre (14), "the Homer of the insects," and Louis Couturat (8), one of the founders of the *Revue de Métaphysique et de Morale*, editor of the manuscripts of Leibnitz found in Hanover, and projector of an International Encyclopedia of the Philosophical Sciences. As to the Germans we can notice only August Weismann (4) who is described as holding tenaciously to a mechanical conception of the universe, and Theodor Lipps (1) whose work in æsthetics, ethics and logic is made akin to those of Brentano, Meinong, and Cornelius. From Great Britain comes an account of the late A. C. Fraser (10), the editor of Berkeley's work, as a thinker who was independent of German philosophy, free of a technical dialect, and therefore influential upon public opinion.

In France, says Lalande (9), philosophical work and production ceased at the beginning of the war, but has since revived in studies of the origins and grounds of the war. In these the doctrine of natural rights has come to the fore and that of individual liberty is emphasized by Boutroux, Bergson, and Blondel.

Wundt's folk-psychology is held to be the crowning achievement of his thought (5), yet his treatment is criticized as unhistorical and his theory of the folk-soul, as an over-individual actuality, is called a mere fallacious conceptualizing.

Burrell's account (2) of the plot of Plato's Republic is dry, but Stocks's tracing of Plato's psychology to Pythagoras is very ingenious (13).

American contributions for the year are varied and voluminous. Ruckmich (12) contends that while native psychology lacks historical background, it has taken its place in the world as an undisputed natural science. This is shown by a large number of articles under the heading of general apparatus and technique. Most significant is a series of papers in honor of Josiah Royce on his sixtieth birthday. His general reputation is considered by Howison (7) as not due to his Hegelianism but to his voluntarism, and his pedagogical influence (6) to the doctrine of each individual being a unique embodiment of the absolute will. Royce's success as a teacher (3) is attributed to the fact that he possessed the maximum historic consciousness with the minimum of slavery to the past. All this is borne out by what proved to be Professor Royce's last public words (11), an inimitable compound of wisdom and humor, never to be forgotten by those privileged to hear them.

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GENERAL STANDPOINTS: MIND AND BODY

BY WALTER T. MARVIN

Rutgers College

Several problems belonging to the philosophy of life and mind are to be found among the prominent subjects of current discussion. Neal (14) revives an old-fashioned argument in favor of vitalism: first, that vitalism is opposed not to mechanism but to mechanism turned into a universal materialism; and second, that materialism and even dualism are rejected by the philosophical thought of modern times in favor of idealism. That is to say, the issue between mechanism and vitalism is to be settled in favor of vitalism by accepting an idealistic philosophy rather than by any possible results coming from experimental research. To appeal in the matter to the results of research is to appeal to the wrong court. Haldane (6) maintains that the notion, *life*, is fundamental. It can not be defined in terms of anything simpler. "Life is a whole which determines its parts. They exist only as parts of the whole." Moreover, this idea can be made use of in research. "The whole is there, however little we as yet comprehend it. We can safely assume its presence and proceed to discover its living details piece by piece, in so doing adding to our knowledge of the whole." Brown (3) reformulates the philosophical principle of structural levels in the scientist's world, showing that what so much perplexes us in such problems as those of life and mind is reducible to different orders or levels of organization. Each level from an electron to mind and society is an integration of the entities of the lower level and exhibits new properties as the result of its more complex organization.

To the question: Does structure determine function, or does function determine structure, or does each determine the other? Abbot (1) replies: Teleologically, function determines structure; but mechanically, structure determines function. For example, "the physical nature of light and color as a mode of energy has determined, as final cause, the general nature of the organ which shall be sensitive to or stimulated into activity by it. Equally obviously the actual structure of the organ sensitive to light in any given biological unit, whether the red spot of the starfish or the eye of man with its nervous connections, will determine, as an efficient cause, the extent and completeness of the reaction made by

that unit." In a second article Abbot (2) discusses the biological point of view in psychology. From this point of view man is a biological unit reacting to an environment. In him the psychical event is always some reaction; and his mind is "the organized whole of the psychic reactions, or the capacity to react in psychical ways, or the content of the psychical reactions." Man's mind is related to man's body as "function or activity is related to structure." Finally, to understand psychic reactions we need to know two things, the structure that subserves the function and the function that is subserved.

Purpose and teleology also have been subjects of current discussion in the philosophy of mind. Warren (15, 16) analyzes the nature of purpose as observable in conscious volition and with the results of this analysis studies first, purpose in "objective" or biological behavior and second, "the rôle of purpose in the general scheme of nature." The distinctive feature of purposive experience is "the inversion of the usual time order of certain events. Representation precedes presentation, the general precedes the particular." Five factors are involved, forethought, assent, potency-feeling, notion of self and sense of fitness. The purposive behavior of organisms is characterized by two of these factors, for anticipation is genuinely present and so is fitness. As to purpose in nature or in the origin of the cosmos, search finds no clear evidence of anticipation or preparation. However, in the general scheme of *cosmic history* "we find indications of a *trend*, but not of *purpose*." Henderson (7, 8) reaches the conclusion "that in one of its most important aspects the teleological appearance of nature depends upon an unquestionable relationship between the original characteristics of the universe which, because it is merely a relationship and in no sense a mechanical connection, because it is unmodified by the evolutionary process and changeless in time, is to be described as teleological." The aspect particularly in question is the remarkable *collection* of properties and activities found in the three elements, hydrogen, carbon and oxygen and in their compounds water and carbonic acid.

The nature of the mental also has been a subject of current discussion. The standpoint of MacDougall (12) is expressed as follows: "Personal experience is intelligible only when conceived in terms of a significant process in which, through reaction upon a conditioning and modifiable world, certain practical and theoretical ideals are realized. The primary aspect of all experience is this

rearrangement of its materials in the service of an ideal order. The specific content of any such ideal must be stated in terms of the subject of experience and its demands, whether the organization be practical or sentimental or logical. The forms of organization comprised by the cycle of experience are thus never to be referred to objective determinants, such as the recurrences and juxtapositions which are to be found in their material elements. Every unity of experience reflects the synthesizing activity of the self which is universally originaive. To refer it to the unities of the world of physical stimulations is unthinkable." Dunlap (5) distinguishes between *consciousness* and *content*. Consciousness is the awareness of something, that is, of content. Perception and thought "designate the two sorts, or forms of consciousness: *perceiving* and *thinking*, together, designate all that can be included under *being conscious*." Introspection is "observation through myoesthesia and observation through other somatic and visceral senses, as opposed to external observations through vision, touch, etc." The field of psychology is occupied by three studies, analytic, or objective psychology, the science of behavior and the study of the mind. This mind is not "an inner world of psychic reality distinct from the world of perceptible outer objects." What it is, Dunlap promises to make clear in a later article. Hollingworth (9) claims that the distinction between "the natural or physical order" and the "mental order" is a matter purely of statistics. Experiences differ by being, at the one extreme, indefinite and rare and, at the other extreme, definite and common. Now they are psychical in so far as they are the former and physical in so far as they are the latter. "The physical world consists of those experiences which are statistically common. The independence of these objects, their stubbornness, their resistance, their objectivity and naturalness, these all are not unique characteristics which suffice to split experience in two, they are merely various and interesting ways of stating the same statistical fact. The dependence, the subjectivity, the personal character of other experiences, the so-called mental order, are merely literary terms which express their statistical limitations and their consequent vagueness and complex conditions of appearance." Hence it is quite unnecessary to insist on giving up either end of the experience continuum, or to talk as though either differed from the other fundamentally or qualitatively, or again to adopt a mysterious and inexplicable dualism. Marvin (13) points out that during the past three centuries science has been

outgrowing the notions of *cause* and *substance* and has been replacing them by the notions of *function* (*mathematical*) and *structure*. He identifies behaviorism and the new realism as this same tendency manifesting itself in the field of psychology. Lowenthal (10) calls our attention to many parallelisms between the elements of Holt's doctrine of the nature of consciousness and the elements of Spinoza's monistic and rationalistic metaphysics.

Within general psychological theory several fundamental matters appear in current discussion. Watson (17) shows how the study of conditioned reflexes can be made to take the place of introspective study. Again, Watson (18), in analyzing the concept "mental disease," reduces the phenomena pointed out by the Freudian to twisted or disturbed habits. These habits in turn can be conceived much more simply by being looked upon as special forms of conditioned reflexes. McComas (11) claims that there is an obvious extravagance in the theory that "a motor expression accompanies *all* conscious processes." "No one will deny that there is a deep-seated tendency for the incoming impressions to go out into motor expressions; but there is nothing more than a *tendency*." If the motor theory were universally true "then the motor areas would be most important for consciousness. Injuries in them should do greater damage to consciousness than injuries elsewhere." But the reverse is true. If a chain of several neurons offers higher resistance than that of a few then may it not happen that impulses sometimes get stalled? Buddenbrock (4) shows the inadequacy of the tropism theory of Loeb. The conditions premised by this theory are not always present, and yet the tropisms take place. Sometimes when they are present the tropisms take place in a manner to contradict the theory. Finally, the theory is inadequate to explain even the turning around a vertical axis in symmetrical animals. Hence Buddenbrock retains his "old opinion that tropisms, like all other reflexes, were originally individual actions, which, in the course of time, have become mechanical and involuntary."

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CONSCIOUSNESS AND THE UNCONSCIOUS

BY H. W. CHASE

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There can be no question that consciousness is rapidly losing its standing as a respectable member of the psychologist's vocabulary. Titchener, in the preface to his new text (13), says: "I have avoided the term 'consciousness.' Experimental psychology made a serious effort to give it a scientific meaning, but the attempt has failed, the word is too slippery, and so is better discarded." The elusiveness of the conception appears from a different point of view in the suggestions given as to the topic for discussion at the annual meeting of the American Philosophical Association (7). Two questions are proposed; is the division of experience into mental and physical to be retained, and, if so, how is it to be formulated. Eleven different sorts of criteria of the term "mental" in current discussion are briefly stated, and a full bibliography is appended.

Pillsbury, in his new book (10), retains the term consciousness, using it in the sense of the whole grouping of mental states at one time. He also points out that attempts to state its conditions have failed. "The most that can be said is that of the different systems that are found within the nervous system at any one time, the largest and most active is accompanied by consciousness" (p. 553). As for the subconscious, it is evident that most neural activity is not accompanied by consciousness, but in view of the fact that we know so little of the conditions of consciousness, speculation as to whether such phenomena have a psychic side is of doubtful value. McDougall (9), who uses the word apparently in the sense indicated above, defines the subject-matter of psychology in terms of its extent; every fact that the psychologist touches must "either be itself a fact of consciousness or be restatable as a condition or product of consciousness." But conscious phenomena get their form and their value from an underlying and unitary self.

Dunlap (3) insists on a distinction between consciousness and its content. Consciousness is the awareness of a content, either present or non-present (objectively). In this sense, consciousness is not observable; it is impossible to find true instances of the "awareness of an awareness." The content, to be sure, is observable, but not as the series of psychic objects which are usually assumed to be visible through introspection. What is really observed is a series of bodily changes. This is defended in the case of feeling and of image, which are reduced to "muscle-contractions." By the subconscious is meant simply the fact that muscle-contractions appropriate to a situation may exist without becoming content of consciousness. There is needed a term for the totality of conscious content; the word "mind" should be used with this meaning, and is admitted to "the place of honor as the chief subject of the psychologist's study." McComas (8) publishes an interesting critique of motor theories of consciousness. Such theories he considers extravagant, when they assume that all consciousness is conditioned or accompanied by motor activity. The theories of Dewey, Münsterberg, Judd, and Watson are briefly stated. The author's criticism points out that such theories assume as a general principle what is true only of special cases. Motor areas are not so important for the integrity of mental life as such theories would assume, nor is it conceivable that each quality of sensation finds representation in a characteristic motor response. The method of expression has not been able to demonstrate unambiguous results

in the realm of feeling, nor are speech-movements always obtainable with silent reading or recitation. The belief that the motor process is also the central and the sensory process is a distortion of a valuable truth. Hollingworth (4) denies the existence of a gulf between physical and mental. Experiences are classified under one or the other rubric according to their statistical frequency; all are really psychophysical. The experiences which occur least commonly constitute the subject-matter of psychology, which is thus "the science of statistically variable experience." There is no need to assume a consciousness conditioned by other criteria.

Kempf (5) raises the question whether the monkey may not exhibit self-consciousness. He finds one rhesus monkey which seemed to try to disguise his motives from his fellows, and, on this ground, is inclined to answer the question in the affirmative. He goes on to ask whether such consciousness of self may not add a constant variable that makes it impossible accurately to predict the responses of such organisms. Smith (12) is also interested in the question of consciousness in the animal series, but not to the exclusion of behavior data. A review of the book does not fall within the scope of this article.

Watson touches on the question of the subconscious in his attempt to work out a behavioristic terminology for mental disease (14). It is of course a matter of habit systems, and its disturbances are matters of "habit twists." The difference between conscious and subconscious habit systems lies in the fact that the subject cannot phrase in words those which are subconscious. Prince (11) restates his thesis that the meaning of ideas is to be found in their subconscious settings, sometimes partly in the twilight zone of consciousness. This principle, with a view of instinct, emotion and sentiment derived from McDougall and Shand, is applied to the conception of the psycho-neuroses. Dooley finds that by the word-association method it is easy to uncover conscious and subconscious complexes in normal individuals (2). Reactions which are most self-conscious tend to occur most slowly. The association of ideas is frequently determined by subconscious factors, often in a very intricate fashion. The existence of complexes unknown to the subject may be demonstrated, but it is not true that, as Freud holds, these are invariably of a sexual nature. Dearborn (1) insists on the importance of a knowledge of cenesthesia, including kinesthesia. This constant stream of sensations, resulting from the constant motion of every organ and tissue, is integrated by some such agency

as Kant called "the transcendental unity of the understanding," and gives rise to the subconscious, the dynamic part of mind. "To ignore the subconscious as an element of mind in one's thought . . . is as unsanctioned as for a physician to refuse the fact of the infectious origin of some diseases."

It seems a pity that a part of the immense labor which Jung must have undergone in writing his *Psychology of the Unconscious* (6) could not have been expended in learning something of modern psychology, of which he shows an amazing ignorance. There is in his work so much that is vital and suggestive that a reinterpretation in more scientific terms would be a real service. Essentially, the driving force of human conduct is conceived as the "libido," a stream of vital energy which is not altogether sexual, as Freud says, but which comes to flow through all sorts of channels, including the sexual. The libido, to change the figure, attaches itself to various sorts of objects, which then become of value and worth to the individual. At first, in child and race, these objects are few in number and are those which have to do with the immediate needs of the individual and with those persons with whom his relationships are closest. Gradually, after a struggle with the old, the range of objects is widened, and the individual gains a harmonious balance of interests and tendencies. Most of this is, of course, just old fact in a new dress; the bulk of the book is taken up by a statement and attempted interpretation of the symbols by which individual and race have depicted to themselves the various phases of the process. The inner meaning of such symbols is usually unknown to those who create them, they must be analyzed to be understood.

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INTROSPECTION AND GENERAL METHODS

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Developing the program of a psychology in which introspection has no part, Lashley (7) reviews the work done on the conditioned salivary reflex in man, urging the importance of this method for study of the mechanism of learning; and Watson (19) reports work with conditioned motor reflexes in man, concluding that the method is widely applicable, *e. g.*, in pathology as well as in studies of memory, association reactions, and problems of sensory experience.

Brown (3) considers that the conscious entities of the introspectionists are "really nothing but integrations of physical states and organic processes"; and Abbot (1) argues that psychology can be objective only by understanding that mind is related to brain as respiration is to lungs, and that all reactions are adaptive to the complete environment. Hollingworth (6) finds that introspective psychology has failed to discover qualitative differences between the several kinds of experience which are supposed to have different degrees of objectivity, and that the true distinction between the psychical and the physical is simply the statistical difference between the "indefinite and rare" and the "definite and common"; "in this sense, and in this sense alone, psychology may properly be defined as the science of behavior—it is the science of the behavior of statistically variable experience." According to Givler (5) behaviorism is "a theory of the criteria of mind and not a system that can be substituted for psychology," but he also writes that "minds are what human bodies do with nature." Psychology

should reject the concept of causation, and should aim at descriptive laws of functional dependence.

The series of Bonaventura's (2) articles concludes that reports of subjective certainty depend upon a reconstructive activity, which tends to false report, and an opposing activity which he calls introspection. Strictly speaking introspection is always retrospection: it can never be wholly accurate, few people possess the power to any considerable degree, and even experimental use of it cannot be expected to give valuable results. The material available for psychology is the product of a psychic activity, but never the activity itself: these phenomena may be studied objectively; and from them may be inferred "the qualities and forms of the psychic processes which have determined them." MacDougal (9) also holds that psychology deals only with phenomena, taking the events in the mental life from the standpoint which conceives them in terms of content and relation, not in terms of forms and significance. Psychology must postulate the existence of the self as an intuited, noumenal reality, but can deal with it only as phenomenal: "the self is the summum genus of the psychologist, the theoretical concept which expresses the necessity he finds for a common reference in all the phenomena he considers."

In his elementary text-book Titchener (16) abandons the term consciousness, and would be willing to let introspection go, but retains it temporarily as the name for observation—the method of all science—when made with the distinctive psychological attitude, *i. e.*, viewing the world "as it is in man's experience," "the world with man left in." The general problem of psychology is "to analyze mental phenomena into their elements, to discover the laws of mental connection, and to work out in detail . . . the correlation of mind with the nervous system." In Pillsbury's (10) text psychology is said to have two methods, observation (by others) and introspection ("self-observation"). The explanation of mental states should be in terms of antecedent mental states as far as possible; but in some problems it is necessary to admit that "mind and body undoubtedly interact."

Turro (17) argues for the necessity of introspection, but considers that by itself it gives material only for a descriptive science; psychology should be a causally explanatory science, however, as neural processes are demonstrably "indispensible conditions" of the psychical processes. The term introspections is used by Forel (4) for what he calls the primary psychical syntheses, whose

"energy-elements" cannot be discovered by any analysis of these experiences: secondary syntheses, comparisons of introspections, form the body of all science. Wallis (18) thinks introspection is without value when it is individual or "within," but that it can be made social or "without"; and Ossip-Lourié (8) argues that the method of psychology is "neither purely subjective nor exclusively objective."

Investigating the actual use of the method of introspection Ruckmich (11) finds "there are roughly two and a half times as many introspective as non-introspective experimental papers" in the American periodicals for general psychology from 1905 to 1915, and that "introspection has contributed more generously to normal, human, adult psychology during the past decade than has any other method."

The historical method in psychology is discussed by DeSarlo (12), who urges it has not received adequate attention: it should be applied to all the forms of psychic life. As used in psychology it must assume the developing process has a teleological character; but the directive ends are often not conscious, and so not apparent to immediate observation: the historical method is required to determine their character.

Concerning definitions, Smith (13) argues that in any science some apparent judgments of fact are really only concealed definitions, and as such are dependent on choice; and that within any given science the choice cannot be properly made until one can "forsee the effect this choice will have upon its cognate disciplines."

Methods of computation, of some general applicability, are described by Thorndike (15) for determining the probable relative order of a set of terms when each of the available judgments of order deals with only a part of the set, and by Spillman (14) for calculating the probable size of some hereditary groups when certain incomplete data are the only ones available.

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BIBLIOGRAPHICAL

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Hilger's (3) summary of the literature of psychotherapy in 1912-13, although limited in scope, is valuable on account of its full resumé. A most complete contribution to the bibliography of child study is that of Waddle and Root (6), with 845 titles under 22 headings. The bibliographies seem well chosen and valuable. Several of the bibliographies included in Burnham's pamphlet (2) deal with the psychology of childhood; we should also mention the earlier work in the same series, containing bibliographies on Educational Psychology (No. 3, published 1913).

Among the bibliographies of individual authors should be mentioned the list of Royce's writings (4) in the Royce number of the *Philosophical Review*. While a majority of the references lie in the

field of philosophy, Professor Royce's contributions to psychology should not be overlooked. In addition to his *Outlines*, we find 18 articles dealing with a wide variety of psychological problems, ranging all the way from mental pathology and psychical research to imitation and invention. The examination of John Bunyan's mentality in the first issue of the *Psychological Review* furnishes an excellent example of the author's incisive analysis.

Most of the bibliographies on special topics are found in the works listed in the special reviews devoted to these topics. Ruckmich (5) gives a supplementary bibliography on Rhythm with 66 titles. The original list appeared in the *American Journal* for 1913.

In connection with the editorial change in the *Psychological Index* it is perhaps worth while at this time to mention the bibliographies contained in this annual (1), which supplement the lists appended to our general reviews. The annual general bibliography appearing in the *Zeitschrift für Psychologie* has lately been substantially the same as the *Index*, but prior to 1900 the lists differ considerably and both should be consulted.

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APPARATUS

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Aside from the instruments which have been described in the *Psychological Review* series of publications and those described in connection with various investigations in which they have been used, the following deserve mention:

The instrument described by Garten (1) works on the principle that the vibrations of the very small soap membrane are photographed through a microscope focused on a very minute fragment of iron suspended magnetically. This method makes it possible to register very high tones, *e. g.*, the highest of the Galton whistle. The article contains a good review of related methods of registration.

Strein (3), working in the phonetic laboratory of Hamburg, has submitted the various means of securing a graphic record of the voice to critical examination, and has published a 270-page report on the technique of the apparatus involved, particularly the clock works.

Wethlo (5) describes a new turbo-stroboscope which consists of Flatau's laryngoscope mounted with and driven by an air pressure turbine. The turbine is no larger than a walnut and is capable of making about 250 revolutions per second, thus making it possible to see high frequencies of vibration with a convenient instrument.

Patten (2) describes an instrument for projecting a small spot of light suitable for exploring photo-sensitive areas. It consists of a microscope with a small tungsten bulb in place of the ocular. The rays projected through the objective furnish the required stimulus under accurate and convenient control.

The myosthenometer described by Tilney (4) is essentially a dynamometer in which a plunger operates against a calibrated spring and registers in kilograms. The instrument is of such form that it may be used as a reflection liminometer on hand or foot.

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TEXTBOOKS AND GENERAL TREATISES

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Titchener's (7) *Beginner's Psychology*¹ appeared too late to be included in last year's summary, but owing to its importance for the teacher of psychology brief mention should be made of it, even at this late date. It supplants the old Primer which will not be revised.

Pillsbury's (5) new textbook is in style similar to his *Essentials of Psychology*, but it contains much more material. The number of chapters is the same, and the titles have been but slightly altered, but the present book is almost twice the size of the former. As the author states, the book is half way between a small textbook and an elaborate reference handbook. It is very inclusive, containing a great many subheadings, each of which is treated briefly and clearly so that the book may very well be used by the beginner as a reference book. The author has aimed to make the book as objective and impersonal as possible. It is much more a collection of facts than a systematic unified treatise. The author does not even allow his behavioristic bias to prevent him from treating sensation and perception in structural terms. Long discussions and criticisms are avoided, and theories open to serious controversy are omitted. On the other hand much space is given to a description of important experimental findings. A large section of the book is devoted to the anatomy, physiology and psychology of sensation. Under perception space perception is the most fully treated. Under memory is included a large section upon recognition. The treatment of reason is half psychological, half logical. The last part of the book covers the instincts, emotions, will and the self.

Von Aster (1) has written an introduction to psychology for the popular series *Aus Natur und Geisteswelt*. He has touched upon the main problems of psychology in a conventional manner. The style is serious, often very technical and it is a question how far the untrained reader will be able to understand him. The author is strongly influenced by Lipps and by the Würzburg School. There is considerable arm chair non-experimental reflection with frequent excursions into the realms of values and epistemology. The book is intended for the German public, each chapter beginning

¹ A special review has appeared in the BULLETIN for November, 1916.

with references to a few German texts. Physiological and experimental facts as well as an occasional more extensive theoretical discussion appear in small print.

Poffenberger (6) is the author of a collection of loose sheets describing forty-eight experiments for use in the psychological laboratory. Each sheet deals with a separate experiment, the arrangement being similar to that followed by those laboratories which use loose mimeographed sheets for their instructions to the students. At the top is a reference to one or more texts dealing with the particular problem. Then follows a statement of the problem and the materials to be used. The procedure and method of recording the results are described for the most part in detail, and finally the nature of the conclusions are suggested by a series of questions calling the student's attention to the various facts of the experiment. Most of the exercises are based upon well-known experiments, a goodly number of which have appeared from the Columbia Laboratory. Where, from the nature of the experiment, it is inadvisable for the subject to have a knowledge of the procedure or the nature of the results only the references and statement of the problem are given. Special attention is devoted to an encouragement of introspective analysis on the part of the student. Most of the experiments deal with the higher processes of perception. There are several experiments upon the psychophysical methods for obtaining the various thresholds. A number of the sheets deal with problems of memory, among which might be mentioned the interesting ones upon "Retroactive Inhibition," "Curve of Forgetting," "Memory for Names and Faces," and "Incidental Memory." Habit and practice, the nature and various forms of association and the functioning of images are covered by a series of tests. Muscular fatigue is studied by means of the ergograph and tapping-board and visual space perception by the stereoscope and pseudoscope. Practice in the use of the tachistoscope is afforded by experiments on the span of perception, the perception of number and form, etc. Finally there are a number of experiments covering problems in æsthetics. The value of this loose leaf manual is increased by the privilege of buying separate experiments if ordered in quantities.

Langfeld and Allport's (2) experimental manual is intended for use in introductory training courses. Instead of aiming at completeness the authors have selected a sufficient number of experiments for a half course, which can be easily performed by the be-

ginner, which can be carried out by a large class in the same room, which will impart a knowledge of the principal methods and important facts of psychology, which require no expensive instruments and which give clean cut results. There is a detailed description of method for each experiment as well as complete instructions for the recording of results. Descriptions and illustrations for making the simple instruments together with cuts explaining the manner of tabulating the data have been introduced wherever necessary. Throughout the aim has been to make the student as independent of the instructor as possible. There are seventy-eight experiments, some original and the others modifications of well-known experiments selected as evenly as possible from the various fields of psychology. About a third of the book is devoted to the sensations. The various forms of space perceptions are illustrated and several experiments are devoted to the perception of time. The span of perception, and the perception of words and meaning including the determining tendency are also included. There are chapters upon attention and the association of ideas, including the practical problem of the detection of suppressed ideas. Under memory the students are given the opportunity of analyzing the learning curve. Imagery is also studied and the last section is devoted to the various methods of experimenting upon the affective processes with special reference to æsthetics. At the end of each experiment there are a number of questions dealing with the method and facts of the exercise and the wider theoretical and practical significance of the results.

Washburn's (9) book upon movement and imagery considers in so thorough a manner so many fundamental facts of psychology that a description of its contents seems in order in this place. The subtitle "Outlines of a Motor Theory of the Complexer Mental Processes" indicates the purpose and wide scope of the treatise. The opening chapter deals with the combinations of movements into systems and "sets." There are two kinds of systems, successive and simultaneous. The first has its order determined and irreversible, the second indeterminate and reversible. This latter may be resolved into irreversible successive movements. All consciousness is accompanied by movement and the question arises whether this movement is unhampered or inhibited. This leads to a critical discussion of Münsterberg's Action Theory which, by asserting that vivid consciousness is conditioned by free motor discharge, comes in conflict with the introspectively discoverable

features of habit formation. In order to reconcile this theory with the facts the author alters the theory in the direction of the simultaneous excitation and inhibition of motor impulses: "consciousness accompanies a certain ratio of excitation to inhibition in a motor discharge and . . . if the amount of excitation either sinks below a certain minimum or rises above a certain maximum, consciousness is lessened." The application of this theory is fully illustrated in the next chapter, where the five degrees of motor responses and the accompanying consciousness are described. The kinæsthetic excitations are an essential link between movements, the kinæsthetic impulse of movement *A* initiating the following movement *B*. This kinæsthesia, frequently the result of very slight movements, called by the author tentative moments, is not always discoverable by introspection, but it is nevertheless present and of great functional value. There then follow several chapters upon the various phenomena of association and memory, with interesting interpretations in motor terms. "The Problem of Purpose" considers the "Aufgabe" and the determining tendency. The motor explanation of purpose or determining idea is in terms of persistent tentative movements. In the discussion of the reasoning process there is an interesting explanation of logical fallacies in motor terms. In so-called imageless processes there is kinæsthesia and that introspection does not always find it is no argument against its existence. It is then shown how the various attitudes familiar to students of "imageless literature," such as feelings of relation, of familiarity, etc., may be readily analyzed. In the last chapter the various factors causing disassociation are described. It has been impossible in this short space to do more than suggest a few of the many points considered. The book is probably the most thorough attempt to apply a motor theory consistently to the various higher mental processes.

In the same series as von Aster's book appears a little book by George Sommer (8) in which he has incorporated a course of lectures upon intellectual endowment and inheritance. The author's interests are both psychological and practical. The problem of eugenics is prominent. The first part of the book is devoted to a description of the central nervous system. Much attention is devoted to the various theories of inheritance. The nature and importance of instincts is also discussed and the responsibility of parents in regard to the mental attainments of their offsprings is explained. There is an analysis of talent and genius and the intellectual and emotional characteristics of several historical char-

acters are described with the aim of tracing the origin of these peculiarities. There is considerable space devoted to the discussion of the possibility of the inheritance of acquired characteristics. Although not dogmatic the author seems inclined to accept this theory. There is little new in the book, which is semi-popular and evidently intended for those who have little knowledge of this important subject.

Münsterberg (3) has written a semi-popular book upon the moving pictures, which is divided into three parts. The first deals with the history and development, the second with the psychology and the third with the æsthetics of the photoplay. He believes that it is a new art, distinct from the drama and his main theme is the analysis both psychological and æsthetic of its characteristic features. In the chapter upon "Depth and Movement" stereoscopic vision is explained, but special interest is directed to the perception of movement with emphasis upon the fact that movement is not merely a perception of successive points in space. The experiments of Wertheimer and Korte are described to show that an explanation of movement must include central factors. In the chapter upon "Attention" the factors effecting attention in life, in the drama and in the photoplay are given. Not only, however, can the photoplay cut back, it can also cut off and by subtle suggestions encourage the play of the imagination. The most important feature of the photoplay is the arousal of the emotions and it is to this subject that the last chapter of the psychological part of the book is devoted. In place of the spoken word the actor must substitute heightened emotional expressions of face and gesture. Also the technique of the camera offers numerous ways of arousing emotions in the audience.

Patrick (14) shows in a collection of essays, four of which have already appeared in magazine form, that the desire for relaxation from the strenuous intellectual life is the final explanation of play, laughter, profanity, the use of alcohol, and war. The treatment is psychological, psychogenetic and sociological. The three important theories of play (Schiller-Spencer, Gross, and Recapitulation) are reviewed and found wanting. The essential explanation is not the desire for a safety valve for excess energy or a preparation for the battles of life, but a relief from the strain of the present strife by a return to the primitive instincts and activities. The necessary daily struggle requires a continual exercise of comparatively new functions. Relief is found in activities along the well-worn paths.

It is the nature of the child to play. The sports of the adult are similar to those of the child and it is shown how they also have their origin in primitive activities. Laughter is also a relaxation from the serious pursuits, but a supplementary principle must be added, that of exultation. Profanity, which is now a means of relief, has also its origin in this ancient struggle. For the most part the profane words were used to terrify the enemy. After showing that alcohol has no beneficial effect upon the organism and therefore cannot be desired for that purpose, the author asserts that the craving for the drug is due to the fact that it benumbs the higher intellectual functions and enhances the activities of the lower and older activities. Man is not by nature peace loving. Periodically he must revert to the old instincts of primitive strife and wars will continue unless a permanent and less harmful means for the exercise of his original nature can be found.

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SPECIAL REVIEW

Psychology of Relaxation. G. T. W. PATRICK. Boston: Houghton Mifflin Co., 1916. Pp. vii + 280.

Under this title Professor Patrick has brought together a series of studies on the psychology of play, laughter, profanity, alcohol and war. Four of these have appeared in various periodicals in a somewhat different form. The essay on laughter, the introduction,

which points out the need and timeliness of a consideration of these topics in existing social conditions, and the conclusion, which deals with suggestions of reform, are new. The idea which links the topics together is the idea of *catharsis*, interpreted in a sense derived from modern conceptions of genetic psychology. It is assumed, namely, that the progress of civilization is connected with the development of functions requiring a high degree of effort and attention, incapable of being long sustained without fatigue and tending, therefore, constantly to give place to those more stably organized and more easily exercised, in other words, to the more primitive which, in the interests of progress, have been repressed. The "relaxation" affords relief, redresses the balance of the vital energies, purifies and purges by breaking down the obstructing barriers. The typical cases are play and sport. Children's plays take on characteristically a reversionary form and are not, as Groos held, anticipatory rehearsals of activities that belong to later life: the boy runs, wrestles, swims, climbs trees, shoots with bow and arrow, goes fishing, canoeing, camping, etc. The brain-paths involved are the time-worn, easy paths requiring no new associations, no strong and sustained effort of attention and will. The same thing is true of sport. Profanity is a primitive and instinctive form of reaction to a situation analogous to that of actual combat; its primary purpose is to shock. It is one of the various forms of primitive vocalization analogous to the growl or roar of anger in animals. Its cathartic effect is found in the allaying of emotion, not, however, as a mere vent or drainage-channel, but as a substituted form of useful reaction. The desire for alcohol, which in spite of all the efforts to combat it seems steadily to increase, is due to the tension connected with progress, from which it affords an artificial relief by narcotizing the higher centers and thus liberating the older, freer life of the emotions and primitive impulses. War is a form of "the rebellion of society as a mass against the too insistent urge of progressive forces"; it is "a temporary reversion to completely primitive instincts restoring the balance to an overwrought social brain." Such are the main theses developed in this interesting and readable volume. And the moral is that as relaxation is necessary and desirable, those forms of it which, like play, sport and laughter, are natural and healthful, should be cultivated as against those which, like profanity, alcohol and war, are unseemly, deleterious or destructive.

With this moral every sane and sensible man will be in hearty

sympathy. And the psychologist will readily acknowledge that a flood of light is thrown upon all the phenomena here under investigation by the principles of genetic psychology which the author invokes. Nevertheless it may be questioned whether his application of them is not too general and abstract, whether in their complexity and in the complexity of modern conditions they can be adequately accounted for simply as reactions against the tension of progress and the repression of the primitive. To begin with, the term "relaxation" as meaning release from tension seems of doubtful applicability to the play of children, and even as applied to sport the principle of catharsis seems a little overworked. The present cult of sport and the headlong pursuit of amusement of every description are explained as a reaction from the excessive demands, the excessive tensions of modern life. And this is probably in large measure true. But is it the whole truth? Would it be true of similar phenomena in the decadent Roman Empire? What of the amusements of the idle rich, or of the idle who are not rich? What of sport as a business, a profession? And what of the power and social influence of imitation? In the case of alcohol some doubt is thrown upon the author's contention by the uncertainty and incompleteness of the evidence. The recent investigations of Dodge in the nutrition laboratory of the Carnegie Institution point to the paralyzing effect of small doses of alcohol not on the higher, but on the lower centers, or at least more on the latter. Meanwhile it is certain that men drink from a variety of impulses. But perhaps the greatest objection will be raised to the author's treatment of war. It is, of course, familiar doctrine that war is reversionary, a "relapse into barbarism," a setting free of the old fighting instincts; we also speak of the "war game," suggesting, superficially, the application to it of the principles that govern sport. But to treat it fundamentally as a sport, as fundamentally a natural and practically inevitable demand for release from the high tension of living, in a word, as a sort of grim social holiday, seems not a little inept. It is to be explained, certainly, from the nature of man, but little is gained by regarding it vaguely as a "survival of ancient predatory instincts," and the nature of man finds expression in dynastic ambitions, stiff-necked diplomatic stupidity, communal fears and tribal loyalties, as in the impulse to find relief from the pressure of progress. And surely modern warfare involves for the peoples engaged in it a tension and concentration not less, but, if anything, greater than in times of peace;

there is change in the direction of activity, hardly a diminution in its quality and amount. It is difficult, therefore, to take as serious the view which regards it as "restoring the balance to an overwrought social brain."

In the case of laughter the author himself feels obliged to go beyond the principle of relaxation. This is because in the first instance, following Miss Bliss, he regards laughter as a form of reaction against the repressive forces of society; it is the spontaneous outburst of joy, he says, whenever the old and natural suddenly appears amidst the restrained and artificial. But as this does not seem to account for the laughter of triumph and contempt, appeal is made to the supplementary principle of exultation. Here, however, the appeal seems a little unfortunate. For, if we distinguish laughter from the occasions which give rise to it and the emotions aroused by the situation, the phenomenon is wholly one of relaxation, as is pointed out in the passage quoted from Angell on p. 123. The problem then is to explain why we laugh in some situations and not in others. The mistake arises from the initial identification of laughter with the ludicrous. But one is quite capable of finely enjoying a comic situation without explosive cacchination. And if laughter is the phenomenon of social relaxation described, is it not a little strange that, with the increasing repression of primitive instincts incident to an advancing civilization, the author should have to lament its decline in forms hearty and whole-souled, whereas in the case of amusements and sport the reactions against the tensions of progress appear as extravagant as the demands?

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DISCUSSIONS

EFFECTS OF SMOKING ON ADDING

At the time the writer began this experiment he intended to make an extensive experimental investigation of the effects of smoking on mental work, but on account of other interests he has been compelled to give up his original plan. He presents here the results of his introductory experiment with the hope that others may be led to make experimental studies in this field.

The writer did not begin to smoke until some years after he was out of college. Prior to the time of this experiment he had been smoking for about two years but very irregularly. Rarely

did he smoke more than one cigar a day and frequently he would go for days without smoking at all. He never attempted to work while smoking, but when he turned to mental work after having smoked a cigar he thought he studied less effectively. Smoking seemed to lessen his power to concentrate.

The writer decided to test this hypothesis by determining whether he could add a given number of figures as rapidly and accurately immediately after smoking as when he did not smoke. He arranged a series of typewritten examples in addition. Each example contained one hundred figures arranged in ten columns of ten figures each. The same figure appeared twice in succession in no column and no zeros were used in any of the examples. The daily test consisted in working fifteen of these examples in addition as rapidly and accurately as possible. The test was begun at approximately the same time each day—about thirty minutes after dinner in the evening. On the days the writer smoked he smoked but one cigar and that one immediately after dinner. After smoking the cigar, which usually took about thirty minutes, he at once began the addition test. On the days he did not smoke the thirty minutes after dinner were spent in conversation or light reading. The experiment was carried on for a period of twenty days, the writer smoking only on alternate days.

The results of the experiment are given in the accompanying table:

Serial Days	Errors		Time in Minutes and Seconds		Differences, Sec.
	Smoking	No Smoking	Smoking	No Smoking	
1	—	22	—	23: 50	
2	12	—	21: 30	—	7
3	—	11	—	21: 37	
4	10	—	19: 38	—	17
5	—	8	—	19: 55	
6	18	—	18: 45	—	30
7	—	21	—	19: 15	
8	15	—	18: 10	—	67
9	—	9	—	19: 17	
10	5	—	18: 3	—	34
11	—	7	—	18: 37	
12	10	—	17: 23	—	67
13	—	8	—	18: 30	
14	8	—	16: 23	—	70
15	—	7	—	17: 33	
16	14	—	15: 50	—	76
17	—	11	—	17: 6	
18	6	—	16: 27	—	73
19	—	9	—	17: 40	
20	10	—	16: 11	—	
Averages	10.8	11.3	17: 50	19: 20	

In the first column is given the number of days; in the second the number of errors made in the test after smoking; in the third the number of errors after no smoking; in the fourth the time in minutes and seconds required to perform the test after smoking; in the fifth the time required after no smoking; and in the last column the differences in time required to perform the test between the second and third days, the fourth and fifth, etc.

The results of this experiment show that smoking instead of increasing the time required to perform the test had just the opposite effect, contrary to the writer's expectation, for on the average the tests were performed in seven and seven-tenths per cent. less time on the days the writer smoked than on the days he did not smoke. From day to day the effects of smoking were more marked than the effects of practice; for in every case the time required to perform the test after smoking was less than the time required for the test on the following day after no smoking. These differences are indicated in the last column of the table. As we should expect, the differences increase as the improvement in adding decreases.

From consulting the table it is seen that the average number of errors made in performing the tests after smoking was slightly less than those made after no smoking. However, the difference is so slight as to be almost negligible.

The striking thing about the results of this experiment is that they are in such marked contrast to those obtained by other experimenters. Lombard¹ and Harley² found that smoking tends to reduce the power of voluntary muscular contraction, while Bush³ in a recent investigation on the effect of smoking on mental efficiency sums up his results with the following statement: "A series of one hundred twenty tests on each of fifteen men, in several different psychic fields, show that tobacco smoking produces a ten and five-tenths per cent. decrease in mental efficiency." He found further: "The man who had the highest percentage decrease of efficiency was the one who used tobacco the least; likewise, the man who smoked fifteen or twenty cigarettes daily had less decrease than the man who smoked but two or three. On the other hand, the man who smoked about one cigar a month had far less reaction

¹ LOMBARD, W. P., Some of the Influences which Affect the Power of Voluntary Muscular Contractions. *J. of Physiol.*, 13, 44.

² HARLEY, V., The Value of Sugar and the Effect of Smoking on Muscular Work. *J. of Physiol.*, 16, 118.

³ BUSH, A. D., Tobacco Smoking and Mental Efficiency. *N. Y. Med. J.*, 99, 519-527.

than the one who smokes three to ten pipefuls daily." Unfortunately Bush in this interesting article has failed to give the original data from which his table of percentages has been computed. Furthermore, the description of his method of conducting the tests is not sufficiently detailed to determine whether the marked difference in his results as compared with those of the writer is due to different methods of conducting the experiments or to other factors.

It is quite possible that if the writer had conducted his test at a different time of the day the results would have been different. If the test had required a longer period of time for its performance the results might have been different; for the period of stimulation may be followed by a period of depression. But it is perfectly evident that enough work has not yet been done to justify generalization. The whole subject remains a fruitful field for investigation.

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A METHOD OF CALCULATING THE PEARSON CORRELATION COEFFICIENT WITHOUT THE USE OF DEVIATIONS

To compute correlation coefficients is rather tedious, not so much because of any complexity in any of the operations but because of the numerous opportunities to make arithmetical errors in counting steps from the mean in all possible directions of the data sheet and in the confusion of innumerable plus and minus signs. The following procedure enables one to calculate the Pearson correlation coefficient without computing the deviations and makes it possible to disregard entirely the confusing plus and minus signs which are so vital in the usual correlation computations. The coefficient is expressed as a function of the original numbers to be correlated.

The coefficient is usually expressed in the following form:

$$r = \frac{\Sigma(x \cdot y)}{n \cdot \sigma_x \cdot \sigma_y} \quad (1)$$

This may be rewritten in the form:

$$r = \frac{\Sigma(x \cdot y)}{\sqrt{\Sigma x^2} \cdot \sqrt{\Sigma y^2}} \quad (2)$$

in which x and y represent the deviations from the mean.

The present problem is to derive a restatement of the coefficient in terms of A and B , the two original numbers to be correlated. We will first derive a formula for $\sqrt{\Sigma x^2}$ in terms of A which will, by analogy, enable one to write the corresponding formula for $\sqrt{\Sigma y^2}$ in terms of B . Then a formula will be derived for $\Sigma(xy)$ in terms of A and B . The three formulæ may then be combined into a formula for r in terms of A and B .

*Derivation of $\sqrt{\Sigma(x^2)}$ in Terms of A and n .—*Let

$$x = A - m_a, \quad (3)$$

in which A is an actual score, m_a is the mean of all the scores and x is the deviation of the score A from the mean m_a . Then

$$x^2 = A^2 - 2Am_a + m_a^2.$$

Taking the summation of x^2 , we have:

$$\Sigma(x^2) = \Sigma(A^2) - 2m_a\Sigma(A) + nm_a^2.$$

But $m_a = \Sigma(A)/n$.

Hence

$$\begin{aligned} \Sigma(x^2) &= \Sigma(A^2) - 2 \frac{\Sigma(A)^2}{n} + \frac{\Sigma(A)^2}{n} \\ &= \Sigma(A^2) - 2 \cdot n \cdot m_a^2 + n \cdot m_a^2, \\ \Sigma(x^2) &= \Sigma(A^2) - n \cdot m_a^2. \end{aligned} \quad (4)$$

By analogy we have, for the other attribute B ,

$$\Sigma(y^2) = \Sigma(B^2) - n \cdot m_b^2. \quad (5)$$

*Derivation of $\Sigma(x \cdot y)$ in Terms of A , B and n .—*Let, as before,

$$x = A - m_a, \quad (3)$$

$$y = B - m_b, \quad (6)$$

in which A and B are the two original numbers, m_a and m_b the arithmetic means of the A 's and B 's respectively, x and y are the deviations of A and B from their corresponding means.¹ Then

$$\begin{aligned} xy &= (A - m_a)(B - m_b) \\ &= AB + m_a m_b - m_a B - m_b A. \end{aligned}$$

¹ Since submitting the manuscript for this article I have discovered that Beardsley Ruml has derived independently a formula for the standard deviation without using the individual deviations. Ruml's discussion is identical with that part of the present article which concerns the denominator of the correlation formula. It is contained in the BULLETIN for Nov. 15, 1916.

Hence by summation,

$$\Sigma(xy) = \Sigma(A \cdot B) + n \cdot m_a \cdot m_b - m_a \Sigma(B) - m_b \Sigma(A).$$

But

$$m_a = \frac{\Sigma(A)}{n}, \quad \text{and} \quad m_b = \frac{\Sigma(B)}{n}.$$

Hence, by substitution,

$$\Sigma(xy) = \Sigma(A \cdot B) + \frac{\Sigma(A)\Sigma(B)}{n} - \frac{\Sigma(A)\Sigma(B)}{n} - \frac{\Sigma(A)\Sigma(B)}{n},$$

$$\Sigma(xy) = \Sigma(AB) - n \cdot m_a \cdot m_b. \quad (7)$$

The coefficient is, as before,

$$r = \frac{\Sigma(x \cdot y)}{\sqrt{\Sigma x^2} \sqrt{\Sigma y^2}}. \quad (2)$$

Substituting from equations 4, 5 and 7, we have:

$$r = \frac{\Sigma(A \cdot B) - n \cdot m_a \cdot m_b}{\sqrt{\Sigma(A^2) - n \cdot m_a^2} \sqrt{\Sigma(B^2) - n \cdot m_b^2}} \quad (8)$$

This formula looks more cumbersome than the more usual form, but it is less time consuming in practice, and certainly less taxing on one's attention to numerical detail.

The following is a sample calculation showing a convenient arrangement of the data.

Sample Calculation.—The first column in the following table numbers each individual, the total number of cases being 50. Columns headed *A* and *B* give the parallel scores to be correlated. The remaining columns give values of A^2 , B^2 , and AB .

Substituting the sums of the columns and their means in equation (8) we have:

$$r = \frac{4407. - 50. \times 10. \times 8.}{\sqrt{6042. - 50. \times 100.} \cdot \sqrt{3658. - 50. \times 64.}} = +0.59.$$

The above correlation and several others have been computed by this formula and by the more usual formula. In all cases perfect agreement has been found.

The formula has also been successfully used in cases where the *A* and *B* measures contain both positive and negative numbers.

The particular advantage in using this formula is that correlation work can be carried out by any one who can run an adding

No.	A	B	A ²	B ²	AB
1	4	7	16	49	28
2	13	9	169	81	117
3	8	6	64	36	48
4	3	5	9	25	15
5	13	6	169	36	78
6	15	10	225	100	150
7	12	5	144	25	60
8	18	8	324	64	144
9	20	15	400	225	300
10	12	9	144	81	108
11	8	7	64	49	56
12	14	9	196	81	126
13	17	13	289	169	221
14	9	11	81	121	99
15	7	4	49	16	28
16	2	1	4	1	2
17	12	7	144	49	84
18	14	8	196	64	112
19	9	8	81	64	72
20	14	11	196	121	154
21	15	8	225	64	120
22	19	10	361	100	190
23	12	12	144	144	144
24	7	5	49	25	35
25	1	3	1	9	3
26	13	8	169	64	104
27	11	9	121	81	99
28	16	7	256	49	112
29	6	3	36	9	18
30	10	5	100	25	50
31	4	6	16	36	24
32	7	6	49	36	42
33	14	10	196	100	140
34	12	14	144	196	168
35	11	8	121	64	88
36	5	2	25	4	10
37	2	4	4	16	8
38	11	11	121	121	121
39	7	9	49	81	63
40	5	11	25	121	55
41	5	8	25	64	40
42	16	10	256	100	160
43	10	13	100	169	130
44	10	8	100	64	80
45	8	12	64	144	96
46	6	10	36	100	60
47	7	7	49	49	49
48	10	7	100	49	70
49	10	9	100	81	90
50	6	6	36	36	36
	500	400	6,042	3,658	4,407

$$m_a = 10, \quad m_b = 8,$$

$$m_a^2 = 100, \quad m_b^2 = 64.$$

machine. The chances of arithmetical error are reduced to a minimum. No arbitrary origin need be selected and consequently the corrections for the arbitrary mean become superfluous.

L. L. THURSTONE

CARNEGIE INSTITUTE OF TECHNOLOGY

NOTES AND NEWS

WE regret to announce the death of Professor Hugo Münsterberg, of Harvard University, which occurred on December 16; also the death of Dr. Naomi Norsworthy, associate professor of educational psychology at the Teachers College, Columbia University, on December 25.

ANNOUNCEMENTS have also been made of the deaths of Professor Th. Ribot, in Paris on December 8, at the age of seventy-seven years, and of Dr. A. C. Rogers, a pioneer in the work of proper treatment of the feeble-minded and for many years superintendent of the school at Faribault, Minn., in his sixty-first year.

PROFESSOR S. P. HAYES, on leave of absence for the second semester, will study problems connected with the psychology of the blind at the Institution for the Blind at Overbrook, Philadelphia.

DR. WILLIAM HEALY has resigned the directorship of the Juvenile Psychopathic Institute of Chicago to take charge of the Judge Harvey Baker Foundation, a similar institution in Boston.

AT the New York meeting of the American Psychological Association the following officers were elected: President, R. M. Yerkes (Harvard); Secretary-Treasurer, H. S. Langfeld (Harvard); members of the Council, W. V. Bingham (Carnegie) and H. L. Hollingworth (Barnard). The invitation of the University of Michigan to hold the next meeting at Ann Arbor was accepted.

THE American Philosophical Association elected the following officers at its recent meeting in New York: President, A. W. Moore (Chicago); Vice-President, E. G. Spaulding (Princeton); Secretary, W. T. Marvin (Rutgers). The place of the next meeting was left to the Council to select.

SIX lectures will be given by Dr. E. E. Southard, non-resident lecturer at Columbia University, during January and February as follows: Neuropathology and psychopathology; the brains of the feeble-minded; frontal lobe functions; the analysis of delusions; the unconscious; psychopathia.

THE PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE TWENTY-FIFTH ANNUAL
MEETING OF THE AMERICAN PSYCHOLOGICAL
ASSOCIATION, NEW YORK, DECEMBER
27, 28, 29, 30, 1916

REPORT OF THE RETIRING SECRETARY, R. M. OGDEN, CORNELL
UNIVERSITY

The American Psychological Association held its twenty-fifth annual meeting, in affiliation with the American Association for the Advancement of Science, at Columbia University on Wednesday, Thursday, Friday and Saturday, December 27, 28, 29, and 30, 1916. The general program was conducted in rooms in the buildings of Teachers College. The sessions were attended by larger numbers than ever before. One hundred and forty-one names were registered, while many more participated at times in the various meetings. Fifty-eight papers were read, and several others were listed by title. Except for the papers on mental tests, of which there were twenty-one, the titles did not fall readily within the definite categories which have marked the special sessions of previous meetings. An approximate analysis, however, reveals among the papers fourteen on experimental, five on educational, four on physiological, two on abnormal psychology, and three on behavior. The remainder were of miscellaneous interest.

The special feature of the program was the session held on Thursday afternoon, December 28, in commemoration of the twenty-fifth anniversary of the Association's foundation. This session, which took place in the chapel of Teachers College, was so largely attended that many were denied admission. Papers were read by Messrs. Cattell and Dewey, of Columbia University, and by Mr. Jastrow, of the University of Wisconsin. Owing to an accident which prevented the attendance of President Hall, of

Clark University, a paper prepared by him for the evening banquet was read by Mr. Baird. The anniversary banquet occurred that evening at the Hotel Marseilles, one hundred and seventy-one participating. President Dodge acted as toast-master. The first to respond was Miss Calkins, of Wellesley College, who paid an eloquent tribute to the memory of two distinguished members of the Association, Professors Royce and Münsterberg, who have passed away during the year. She was followed by Mr. George T. Ladd, of Yale University, who made a plea for the broadest development of psychology as a science. President Sanford, of Clark College, presented a witty satire upon modern trends of psychological interest. In the absence of President Stanley Hall, of Clark University, who was also to have been among the speakers of the evening, brief remarks were made by Messrs. Henry Rutgers Marshall, J. B. Watson, E. L. Thorndike and Joseph Jastrow.

On Friday morning a joint session was held with Section L of the American Association for the Advancement of Science. The President's address occurred on Wednesday evening, December 27, in Schermerhorn Hall. It was followed by the annual business meeting of the Association and a smoker.

The apparatus exhibit was held in connection with a general exhibition of scientific instruments located in University Hall. Apart from the exhibits of the Bureau of Educational Experiments and of the C. H. Stoelting Co., of Chicago, the following new apparatus was offered by members of the Association: Electric Stimulus Shuffler, Automatic Timer and Rapid Counter, Artificial Pupil Apparatus, L. T. Troland, Harvard University; Test Puzzles, Grace Helen Kent, Grafton, Mass.; Multiple Choice Apparatus, R. M. Yerkes, Harvard University; Continuous Blood Pressure Conveniences, G. V. N. Dearborn, Boston; Focal Variator and Differential Demonstration Disks, A. P. Weiss, Ohio State University; Graphs of Test Performances of College Students, L. L. Thurstone, Kate Gordon and W. V. Bingham, Carnegie Institute of Technology; Collected Pieces, Madison Bentley, University of Illinois; Worsteds for Color-Blind Tests, Knight Dunlap, Johns Hopkins University; and Automatic Choice Reaction Keys, offered by H. S. Langfeld for S. L. Pressey, Harvard University.

Thanks to the efforts of Mr. Hollingworth, the local member of the Executive Committee, and of Messrs. Woodworth, Cattell and others of the Columbia faculty, the appointments of the various meetings were adequate and the sessions ran their course in an admirably effective manner.

TRANSACTIONS AT THE ANNUAL BUSINESS MEETING

The annual business meeting was held at nine p.m. on December 27, in Schermerhorn Hall, and was well attended. It was voted that the minutes of the previous meeting be accepted as printed. The President then called for the reports of committees. Mr. Bentley responded as chairman of the Program Committee and referred to an action later to be proposed by the Council defining the duties and responsibilities of this Committee. The report was accepted.

Mr. Watson, chairman of the Committee on Election of Officers, reported the result of the ballot of the Association to be as follows: for President, Mr. Robert M. Yerkes, of Harvard University; for members of the Council, elected for three years in succession to Messrs. Franz and Whipple, Messrs. Bingham and Hollingworth. The report was accepted.

Mr. Yerkes reported ten different pieces of work in progress by, and for, the Committee on Standardization of Mental Measurements and Tests. He also reported the financial needs of the Committee to be \$25 in connection with work undertaken by Mr. Bingham on tests for college students, and \$400 for the publication of results on the study of vision conducted by Messrs. Johnson, Cobb, Troland, Watson and Yerkes as a revision of the work previously published by Messrs. Watson and Yerkes. It was voted to receive the report. In the discussion which followed question was raised as to the possibility of standardization, and a motion was made by Mr. Franz that the Committee be discharged. After a debate in which Messrs. Dunlap, Cattell, Buchner, Warren and Jastrow participated, the motion was defeated. It having been remarked that a considerable item of expense to the Association was involved in the free distribution of its publications to its members, it was moved by Mr. Woodworth, and carried, that it was the sense of the Association that its monographic publications should no longer be distributed free to members.

Mr. Bingham reported for the Committee on Teaching Experiments that Mr. W. F. Dearborn had completed a series of experiments on learning, and that Mr. Sutherland was gathering accounts of other teaching experiments. He reported the need of an appropriation of \$20 to further this work, and moved to recommend that the Committee be continued under the chairmanship of Mr. W. F. Dearborn. The motion was carried.

Mr. Baldwin reported for the Committee on the Academic Status of Psychology, and offered in printed form a report entitled "A Survey of Psychological Investigations with Reference to Differentiations between Psychological Experiments and Mental Tests," copies of which will be distributed to the members of the Association. It was moved and carried that the report be accepted, and that the Council be instructed to consider defraying the costs of its printing. Mr. Warren moved that the Committee be authorized to charge an amount not to exceed twenty-five cents for this report, except in the case of a single copy to be sent to each member. Mr. Jastrow moved, and it was carried, that this matter be referred to the Council.

Mr. Warren reported progress for the Committee on Terminology, and hoped to be able to offer some tentative results another year. It was voted that the report be accepted and the Committee continued.

Mr. Woodworth reported for the Committee on the Anniversary Celebration regarding the advisability of publishing the papers prepared for this occasion. It was voted that the question of such publication be referred to the Council.

The Secretary then read the resolutions offered at the previous meeting in amendment of the constitution with reference to the election of officers. Resolutions 1 and 2, containing the amendments to Articles II and III, were voted on second reading, and the constitution now stands amended. Resolution 3, which contains a by-law providing the mode of securing elections, was then adopted with an amendment substituting "seven" for "fifteen" days as the time before the annual meeting when the final count of ballots shall take place. (The above resolutions were printed in full in the annual Proceedings of the twenty-fourth annual meeting, 1915.)

Two letters addressed to the Association were then read. The first was from Mr. M. G. Lloyd, of the *Electrical Review and Western Electrician* proposing the publication of a monthly journal dealing with scientific instruments and methods of measurement and research. Coöperation and support from the members of the Association was solicited. The second letter from the permanent secretary of the American Association for the Advancement of Science called attention to the expiration on January 1, 1917, of the invitation to members of affiliated societies to join the American Association without payment of the five-dollar entrance fee.

The following items of business reported by the Council were then acted upon:

I. Mr. H. S. Langfeld, of Harvard University, was nominated as Secretary-Treasurer of the Association for the ensuing three-year term. It was voted that the Secretary cast the ballot of the Association for Mr. Langfeld's election.

II. An invitation from the president of the University of Michigan to hold the next annual meeting of the Association in Ann Arbor was read. The Council recommended that determination of the place of meeting be left in its hands with power. The recommendation was adopted. (At a subsequent meeting of the new Council it was decided that the invitation from the University of Michigan should be accepted.)

III. Upon nomination by the Council, the Association elected Mr. G. C. Basset, of the University of Pittsburgh, as its representative for 1917 on the Council of the American Association for the Advancement of Science.

IV. The Secretary reported that the Council had ordered three copies of the complete file of Proceedings of the Association since its foundation to be bound for preservation, and that other copies of various years now on hand (3rd to 24th meetings) might be had by persons willing to pay for their transportation.

V. The Secretary reported the deaths of the following members of the Association: Josiah Royce, September 14, 1916, aged sixty; Hugo Münsterberg, December 16, 1916, aged fifty-three, and Naomi Norsworthy, December 25, 1916, aged thirty-nine.

VI. The Treasurer's report, as printed below, was then read and accepted. The following budget, prepared by the Council, was also read and adopted:

ESTIMATE OF RESOURCES

On deposit.....	\$100.00	
Dues.....	300.00	
Interest.....	90.00	
Sale of monographs.....	?	
Authorized withdrawal from principal funds.....	200.00	<u>\$690.00</u>

ESTIMATE OF EXPENDITURES

Printing and supplies.....	\$125.00	
Postage.....	50.00	
Reprints.....	50.00	
Abstracts.....	30.00	
Incidentals of meeting.....	25.00	
Apparatus exhibit.....	25.00	
Election committee.....	50.00	
Secretary's stipend.....	250.00	
Binding of proceedings.....	10.00	
Other committees.....	?	<u>\$615.00</u>

Mr. Yerkes moved, and it was voted, that the Council be authorized to withdraw from the principal funds, at its discretion, \$400 for the use of the Committee on Standardization of Mental Measurements and Tests. Mr. Jastrow moved, and it was voted, that the Council be authorized to withdraw from the principal funds, at its discretion, \$50 to apply on the printing account of the Committee on the Academic Status of Psychology. Mr. Bingham moved, and it was voted, that the Council be authorized to withdraw from the principal funds, at its discretion, \$20 for the use of the Committee on Teaching Experiments.

VII. The Secretary reported the following nominations to membership in the Association, and was instructed to cast the ballot of the Association for their election: H. C. Bingham, A.M., professor of education, Ellsworth College; J. W. Bridges, Ph.D., instructor in psychology, Ohio State University; C. C. Brigham, Ph.D., instructor in psychology, Princeton University; H. E. Burt, Ph.D., instructor in psychology, Harvard University; I. H. Coriat, M.D., assistant visiting physician for neurology, Boston City Hospital; A. J. Culler, Ph.D., professor of psychology, McPherson College, McPherson, Kansas; Josephine N. Curtis, Ph.D., assistant psychologist, Psychopathic Hospital, Boston; E. A. Doll, Pd.M., assistant psychologist, The Training School, Vineland, N. J.; R. M. Elliott, Ph.D., instructor in psychology, Yale University; H. B. English, Ph.D., instructor in psychology, Wellesley College; J. E. Evans, Ph.D., instructor in psychology, Ohio State University; G. O. Ferguson, A.M., associate professor of psychology and education, Colgate University; Sara C. Fisher, Ph.D., professor of psychology, State Normal School, Los Angeles, Cal.; W. S. Foster, Ph.D., assistant professor of education, Cornell University; F. H. Giddings, Ph.D., professor of sociology and the history of civilization, Columbia University; C. T. Gray, A.M., instructor in education, University of Texas; Rose S. Hardwick, M.A., psychologist, New England Home for Little Wanderers, Boston; J. D. Heilman, Ph.D., professor of educational psychology, Colorado State Teachers College; Leta S. Hollingworth, Ph.D., instructor in educational psychology, Teachers College; C. E. Kellogg, Ph.D., Framingham, Mass.; Irving King, Ph.D., assistant professor of education, University of Iowa; Mildred W. Loring, Ph.D., Sarah Berliner Fellow, Johns Hopkins University; M. A. Martin, Ph.D., professor of philosophy and education, Converse College; J. T. Metcalf, Ph.D., instructor in psychology, Smith College; J. J. B. Morgan, Ph.D., Cutting Traveling Fellow,

Johns Hopkins University; W. H. Norcross, M.A., associate professor of psychology, Dickinson College; H. B. Reed, Ph.D., assistant professor of psychology and philosophy, University of Idaho; Mildred E. Scheetz, M.D., Ph.D., assistant physician, Government Hospital for the Insane; Lorle Ida Stecher, Ph.D., professor of psychology, Temple University; E. C. Tolman, Ph.D., instructor in psychology, Northwestern University; M. R. Trabue, Ph.D., instructor in educational administration, Teachers College; H. K. Wolfe, Ph.D., professor of psychology, University of Nebraska.

VIII. The following statement was adopted by the Association in lieu of one now printed on nomination blanks and inserted in the Year Book as a note interpretative to Article I of the constitution:

A proposal for membership signed by at least two members of the Association must be submitted to the Secretary, for the Council, at least one month in advance of the annual meeting. The proposal must be accompanied (1) by a statement of the candidate's professional position and degrees, naming the institutions by which, and the dates when, conferred, and (2) by copies of his published researches. In the absence of acceptable publications of a psychological character, or a permanent position in psychology, the conditions of membership will not be regarded as having been fulfilled.

In this same connection the Council announced the adoption of the following statement of policy:

Proposals to membership that are unfavorably acted upon by the Council must be renewed for action at a subsequent meeting.

IX. With a view to defining the functions of the Program Committee, and the method of submitting papers to be read at an annual meeting, the following recommendation of the Council was adopted:

(1) That the committee be granted full power in the selection and rejection of papers;

(2) That no title shall be accepted unless accompanied by a summary of the paper giving the main points to be developed; that the summary shall be submitted typewritten in triplicate and ready for printing; that it shall not exceed one printed page of the Proceedings, and shall contain no tables or drawings;

(3) That all titles and summaries shall be in the hands of the Secretary on a certain date to be set by the committee and announced to members of the Association;

(4) That the titles of rejected papers shall not be listed on the program, nor their summaries published in the proceedings.

X. The membership of the Program Committee for the ensuing year was announced as follows: Messrs. Baird, Angier and the Secretary.

Under the head of new business the following items were disposed of:

I. It was moved by Miss Martin that the incoming President be asked to arrange for the next annual meeting a symposium on Mental Hygiene. The motion was amended by Mr. Cattell to refer the matter for consideration as to its feasibility to the Program Committee with power. The motion as amended was carried.

II. It was moved by Mr. Langfeld that the Association express its thanks to the local committee for the hospitality of its entertainment by a rising vote. The response was unanimous. The meeting then adjourned.

REPORT OF THE TREASURER FOR THE YEAR 1916

DR.

To Balance from the previous year.....	\$2,729.16	
Dues received from members.....	299.40	
Interest from July 1, 1915 to July 1, 1916.....	93.92	
Sale of monographs No. 51 and No. 53, year ending December 31, 1915.....	12.53	<u>\$3,135.01</u>

CR.

By Printing and supplies.....	95.37	
Postage.....	25.00	
Telegrams.....	1.00	
Reprints of Proceedings.....	26.62	
Reprints of President's Address.....	17.94	
Printing of Abstracts, 1915 meeting.....	15.68	
Incidental Expenses, 1915 meeting.....	9.61	
Expenses Election Committee, 1916.....	37.93	
Secretary's stipend.....	250.00	
Exchange on checks.....	.40	
Dues, undeposited.....	1.00	<u>480.55</u>
Balance in Fifth Avenue Bank.....	99.96	
Balance in Union Dime Savings Institution.....	2,554.50	<u>2,654.46</u>
		<u>\$3,135.01</u>

R. M. OGDEN,
Treasurer

Audited by the Council

ITHACA, NEW YORK,
December 20, 1916

TITLES AND ABSTRACTS OF PAPERS

The Laws of Relative Fatigue. (Presidential Address.) RAYMOND DODGE, Wesleyan University.

TWENTY-FIFTH ANNIVERSARY PROGRAM

Psychology and the War. G. STANLEY HALL, Clark University.

Our Psychological Organization and Research. J. McKEEN CATTELL, Columbia University.

Varieties of Psychological Experience. JOSEPH JASTROW, University of Wisconsin.

The Need of a Social Psychology. JOHN DEWEY, Columbia University.

GENERAL AND EXPERIMENTAL PSYCHOLOGY

The Importance of Making Investigations in Mental Hygiene. L. J. MARTIN, Stanford University.

The aim of the paper is to show that the almost universal use of some form of mental hygiene makes it imperative that the American Psychological Association appoint a committee to present a preliminary report on this subject which shall take up among other matters some of the following:

1. A brief account of the teaching of personal and social mental hygiene in and out of universities and suggestions as to improving it.

2. A curtailed summary of the work which has been done by professional psychologists and others in applying mental hygiene to the preventing and removing of mental and physical weaknesses and diseases.

3. An enumeration of investigations along psychological and physiological lines which have a significance from the standpoint of mental hygiene although not directly concerned with it.

4. Hints as to the most promising and useful fields for research in mental hygiene.

5. An examination of the present laws governing the diagnosis and treatment of mental and physical diseases with a view to the modification of old laws and the passing of such new ones as will aid in the putting of mental hygiene on a more scientific basis.

The Control of Accuracy of Movement. K. S. LASHLEY, Government Hospital for the Insane, and the Johns Hopkins University.

For isolation of the factors involved in the control of the accuracy of extent of movement, studies of movement in patients

showing lesions of the afferent nerve roots and spinal tracts have been carried out. The data obtained indicate: (1) Accurate control of the extent of movement of a limb is possible in the absence of all afferent impulses from the limb; (2) hence, reflex control from a moving limb is unnecessary for accurate movement of the limb; (3) correct report of the extent of unimpeded voluntary movement of a limb is possible in the absence of afferent excitation from it; (4) the judgment of the extent of movement in these patients is made upon the basis of the energy expended, as is shown by the fact that the distances of voluntary movement which are estimated as equal vary inversely with the resistance encountered.

Two Types of Mind-lack Suggested by Cases of Cortical and Sub-cortical Brain-Defect. E. E. SOUTHARD, Boston State Hospital.

The ideas of the paper are drawn from work in the brain anatomy of the feeble-minded (Waverley Research Series) and from certain other material examined in comparison therewith. Enlargements of brain photographs will be presented to illustrate the point.

Notes on Vasomotion in Relation to the Mental Process. GEORGE V. N. DEARBORN, Sargent Normal School.

Nine thousand or more measurements sanction these tentative propositions, as the hemobarograms show: (1) Arterial stuffing and constriction are very active and variable in all persons; (2) peripheral arterial tension is by far the most sensitive and easiest index of vasomotor rearrangement correlate to activity "mental" or "bodily"; (3) the doubleness of blood-pressure measurement ("systolic" and "diastolic") makes possible a partially differential index of activities; (4) the systolic tension represents especially the ever-changing output of the left heart, which latter is quickly variable in size (Gesell) as well as in the frequency of its contraction. The diastolic tension is more dependent on vasomotion, direct and reciprocal. Thus the systolic variations are more directly mental and the diastolic more somatic and vegetative; (5) vasotension-variability is a ready index of the intellectual and affective psychophysical dynamism of an individual ("power of concentration") and as such may have value as a mental test; it is also useful as an index of fatigue, of "nervousness," and of neurasthenia, sometimes; (6) no personal, racial, sexual, or age-differences in the variability have appeared; each hemobarogram is unique; (7) sudden mental

activity, apparently of any sort (*e. g.*, multiplication, imagination of any kind of personal activity, transfers of the attention-line, attention to the arm-sensations, dynamic associations, unpleasant or pleasant affects); active inhibition; breath-holding; and gradual subconscious increase of psychophysical tonus, increase both the systolic and the diastolic tensions, especially the former; so does physical exertion proper; (8) really passive relaxation of the muscles and of the mind; quiet, prolonged recall of happiness; sleep-suggestion; humor; deep breathing; and usually pleasure not allowed to excite, cause a lowering of both; (9) marked rises in both tensional phases occur without conscious accompaniment, suggestive if not demonstrative of the subconscious actions of mind; (10) reciprocal variation of the systolic and the diastolic is very frequent, yet in some cases the two parallel each other for many minutes at a time; (11) true emotion (adrenin and blood-sugar are suggested) lasts much longer than pretended emotion, and "causes" (?) more variation; (12) imaginary neuromuscular fatigue exerts a strong vasomotor influence; (13) *lapsus attentionis* and other less clear conditions lower both tensions suddenly and far; (14) if cerebration proper be dependent directly on blood-supply, the brain must have a hidden and somewhat independent, widely related vasomotion of its own.

Animal, Comparative, and Genetic Psychology: Definitions. R. M. YERKES, Harvard University.

The writer would call the attention of his psychological colleagues to the unsatisfactory usage of the terms animal psychology, comparative psychology, and genetic psychology, in the hope that a scientifically unprofitable situation may be improved by the presentation of what appear to be more logical definitions. At present animal psychology designates the psychology of animals other than the human; comparative psychology is practically synonymous with animal psychology; genetic psychology usually designates the special study of mental development.

The writer wishes to recommend and urge the following usages: (1) That animal psychology shall be used, as contrasted with plant psychology, to designate the psychology of animals, man included; (2) that the psychology of each especially significant type of organism receive its own special designation, as for example, the psychology of man or human psychology, the psychology of the dog or canine psychology; (3) that comparative psychology designate a

method of inquiry, namely, the comparative method, not a particular group of materials or an assemblage of problems (in this sense, comparative psychology would be inclusive of animal and plant psychology); (4) that genetic psychology designate neither a special group of materials nor of problems, but instead, a variety of psychological description, namely, the historical or genetic. Ontogenetic psychology should refer, then, to the study of the development of mind in the individual; phylogenetic psychology, to the study of the evolution of mind in organisms.

It seems decidedly worth while for those who are professionally concerned with the study of mind to accept either these proposed usages, or more profitable ones if they can be found, in place of the current definitions. It is obviously illogical and inconsistent to exclude from the realm of the comparative psychologist any psychological materials whatever. The facts of human life are quite as important for comparative study as are any others. Moreover, it seems wholly natural that we should come to regard genetic psychology merely as a special interest, which may be advanced not only by the application of the comparative method but in many other ways. Behavioristic developments will inevitably favor such usages as are here suggested, and it may safely be predicted that comparative and genetic psychology will gradually come to designate the general science, and human psychology a special and narrowly limited branch of it.

Blood Pressure and the Attention. H. C. McCOMAS, Princeton University.

The following experiments performed in the Princeton Laboratory were designed to detect relations existing between changes in blood-pressure and variations in the ability to concentrate the attention. The apparatus used for blood-pressure was the Oliver manometer. To detect variations in the concentration of attention an apparatus was devised to register discrimination reactions for four differently colored lights appearing in an irregular order for ten minutes. The time of each reaction and the false reactions were registered upon a kymograph.

In one series of tests the subject was examined early in the morning, at midday, late in the afternoon, and late at night. The results show a high positive correlation between the rise in diastolic pressure and the excellence of work in continuous discrimination reactions.

An Ideal Spectroscope for Use in Visual Work. H. M. JOHNSON, Nela Research Laboratory.

Spectroscopes and monochromatic illuminators at present on the market are not designed primarily for use in physiological optics, and none of them is satisfactory for that purpose. Instruments designed for visual work need not have a high resolving power, since the minimal effective difference in wave-length is as great as the difference in wave-length of the two sodium lines. Such instruments should give a maximal intensity of homogeneous illumination, however, together with a maximum of purity. The latter condition cannot be satisfied in any instrument in which lenses are used between the slits, on account of the proportion of incident light which is multiply reflected at the surfaces of the lenses, and superposed on the *main* spectrum. The effects of spherical and chromatic aberration of lenses are also incapable of complete elimination, and in some work are extremely troublesome. It is feasible, however, to use concave mirrors, figured so as practically to eliminate both axial and oblique spherical aberration, having a large angular aperture and a permanent surface of a high coefficient of reflection, in the collimator and the telescope. By this means the most troublesome features may be eliminated.

The parts should be mounted so that the axes of the collimator and the telescope are fixed, and the wave-lengths of the beams selected at the second slit should be changed by rotating the prism. The prism used should be of one of the many "constant deviation" forms; or if an ordinary prism is used it should be placed in a Wadsworth mounting. If the parts are properly disposed all the wave-lengths selected at the second slit will have suffered minimal deviation, and will lie in the axis of the telescope. By selecting a prism of the proper form all of the light suffering regular internal reflection at the unused faces of the prism may be deviated outside the effective beam. The light scattered by the instrument may be thus limited to that caused by imperfections of the reflecting surfaces or by dirt on them.

The improvements described were made possible by the active coöperation of several physicists, but especially of my friends and colleagues Dr. A. H. Pfund and Dr. A. G. Worthing.

A Study of Visual Rhythm. C. A. RUCKMICH, University of Illinois.

Architects, sculptors, mural decorators, and artists in general frequently assume the possibility of visual rhythms. But almost

all psychologists who have expressed themselves on the subject of rhythm are in agreement in limiting rhythmical perceptions to the field of auditory, kinæsthetic, and tactual processes. Earlier investigators confirmed the statements of these writers. A few psychologists admit the rhythmization of visual processes, but maintain that the rhythm is itself carried vicariously by other than visual processes, *e. g.*, by the kinesthetic processes of eye-movement. Aside from its practical bearings, the experimental study of the problem is desirable both on systematic and on methodological grounds. Systematically it seems worth while to discover whether the apparent limitation of rhythmical experiences to certain sense departments is a fact. If it is a fact, the question arises: is this limitation a matter of some innate qualitative adaptability or is it merely a case of fortuitous genetic development? Methodologically it is advisable to approach the problem of rhythm from a new angle for the purpose of reviewing the facts obtained in previous investigations. Rhythms dependent upon visual stimuli of variable intensity and duration have been studied and established; but as far as the writer is aware, no experiments have been reported in which visual stimuli of variable quality have been used.

In our own experiments, lasting over a period of two years, series consisting of one to three differently colored lights have been successively exposed in various temporal patterns. The duration of each light was constant and the colors were equated intensively for each observer in extended preliminary series. The integrations of the corresponding perceptions together with an analytical description of consciousness were recorded. The results indicate rhythmical grouping based upon visual perceptions which are often the clearest processes in consciousness. Many phenomena found in connection with auditory rhythms are also persistently reported: (1) accentuation of a member of a group in terms of the intensity or duration of the visual perception, in terms of visual schematization, or in terms of accompanying processes, (2) alterations in the length of intervals preceding and succeeding accented members, (3) presence of kinesthetic or organic processes.

The Influence of Changes of Illumination upon After-Images. L. T. TROLAND, Harvard University and Nela Research Laboratory.

Hering pointed out the importance of the effects produced upon after-images by changes in the brightness of the projection field. Experiments made by the writer with semicircular after-

images, produced by homogeneous light, and projected on one half of a full circular field of the same light, yielded the following results.

If such an after-image be permitted to fade, dimming of the field will bring it back strongly; it again fades, but if the field be brightened and then dimmed it returns. This can be done several times. The total period of rejuvenation may be twelve times that of the original life of the image on the undimmed field. The total period is a function of primary brightness, preëxposure time, dimming time, degree of dimming, size of field, and of the individual. By use of dimming, after-images can be demonstrated for pre-exposures of an eighth of a second, which leave no noticeable trace on the undimmed field. The color values of the image on the dimmed spectral fields are remarkable, both inherently and in relation to their conditions.

If the projection field is brightened, the faded negative after-image is *reversed*, and becomes positive. There is reversal both of luminosity and of saturation values. The positive image fades on the brightened field, but upon dimming and re-brightening, again appears. The total life of this effect closely parallels that of the regeneration of the negative during dimming, and depends upon a similar, complex list of conditions. The governing laws are strikingly analogous to those of the dimming effect, although in some cases in inverse form.

These two sets of phenomena can be given an approximate explanation on the assumption that preëxposure of a given area of the retino-neural system decreases its resistance to change in its state of excitation. Thus, with dimming, the preëxposed area loses luminosity more rapidly than the other, producing a negative image, while with brightening, it gains luminosity more quickly and hence causes a positive image. There are some indications that this modification of resistance is not receptorial, but is localized in sub-receptorial neurones, or synapses. Recent experiments, not yet completed, indicate that the reversal effect, at least, has a distinct dependence upon the wave-length of the stimulus.

An Experimental Note on an Assumption of the Hering Theory of Color Vision. G. F. ARPS, Ohio State University.

It was found that contrary to the requirement of the Hering color theory the grays composed upon the color wheel under a given illumination did not remain indistinguishable if "the objec-

tive illumination be made very faint." Under certain circumstances it was found necessary to add a "white sector of 25 per cent. to the gray composed of blue and yellow in order to restore equality in brightness."

Among others the following series of experiments were made following as closely as possible the conditions prevailing in the Koenig laboratory: (1) Two grays were matched in daylight illumination and transferred to the dark room. The outer ring was composed of red, green and yellow; the inner of blue, yellow and black. Under decreased illumination the two rings became distinguishable so that it was necessary to add black to the outer ring to restore the match. (2) The two grays were again matched, but in this case the outer and inner rings changed positions on the color wheel. As before the rings became distinguishable. (3) The two grays were matched as before, a heavy white cardboard was placed behind the color wheel and observation made as in the preceding experiments. The gray rings became distinguishable, but this time it was found necessary to add white to the outer ring to restore the match.

The experiments seem to indicate that the perception of the two grays is conditioned by the attending circumstances. The grays are affected by the character of the contrasting background, the effect always being greater on the outer ring. Indistinguishability thus disappears with the changed conditions of observation.

Positive and Negative Perception and Recognition. G. C. MYERS, Brooklyn Training School for Teachers.

I. Of 38 girls of the Brooklyn Training School, 19 crossed out As and 19 crossed out those letters not-As for one minute from a group of 75 As and 75 not-As arranged by chance. The average number of As crossed per minute was 103, of the not-As, 85. The ratio of not-As to As is about .8. Only two cases for the not-As reached or exceeded the median for the As. For 18 other subjects, 9 on As and 9 on not-As, the ratio of not-As to As was still .8 on the fifth successive trial. Likewise merely counting As and not-As gives about the same ratio. According to introspections, in crossing out As the identity of the other letters was rarely noted and in crossing out the not-As the letter A was constantly held in mind, while the identity of those not-A was generally ignored. In conclusion, crossing As is about .8 as difficult as crossing not-As and this ratio is not changed by several practices. Therefore positive perception and negative perception are two distinct processes.

II. The purpose was to study the phenomena of recognizing duplicated elements within a familiar series as compared with the phenomena of supplying omitted members of the same familiar series. Visual and auditory tests were given. For the former, three classes of girls were provided with two lists of the names of their classmates, one with five names omitted, and the other with five names duplicated. Two classes were given the duplicate list first, then the omission list, the other class was given the lists in reverse order. In the auditory test about half of 69 girls supplied omitted names, the other half recorded those duplicated, after one reading by the writer. Then each took the test reversed. These subjects were also tested for omissions and duplicates of numbers between 1 and 15. Five were omitted and 5 duplicated within the same series, for names and numbers.

Supplying and noting duplicates showed about the same efficiency. Of 68 subjects 41 reported the "omissions" as the harder, and 22 the duplicates. Introspections showed an almost universal tendency to check up and memorize the duplicates when they were heard, while the omissions were supplied by subsequently going over all the familiar series and marking those not heard. Therefore, negative recognition (supplying omissions) seems to be fundamentally different from positive recognition (noting duplicates). The study is still in progress.

The Effect on Learning of the Length of Periods of Rest. H. B. HUBBERT, Randolph-Macon Woman's College.

The work described grew out of an interest in problems related to those attacked by Leuba and Hyde, Ulrich, Lashley, and others. The problem is whether a given amount of effort (as measured by the number of trials given) will result in the greatest acquisition of skill if the periods of work fall on immediately successive days or are separated by periods of rest of one or more days. The type of work selected depends on tactile discrimination. The subject was given a pack of 100 shuffled cards containing four "suits" of 25 cards each. The suits were distinguishable by patterns corresponding to them, perforated in the cards. The subjects were required to sort the pack into the four suits by touch alone, the cards and hands being concealed by a screen. Three trials were given at each sitting, and the average percentage of accuracy divided by the average time in seconds constituted the measure of the day's achievement for each individual. The subjects were

students in Randolph-Macon Woman's College, and were divided into four equal groups. Group *A* worked every day; while *between* periods of work group *B* was allowed one day of rest; group *C*, three days, and group *D*, five days.

During the first two thirds of the learning process the achievements of groups *B*, *C*, and *D* averaged several per cent. better from day to day than that of group *A*, the mean variation from the average being relatively large. Group *C* exhibited the greatest and most consistent superiority during this period. As the learning process approached the limit, the advantage, as might be expected, tended to disappear. The results raise several interesting questions regarding the optimal distribution of lecture-periods, study-periods, etc., provided the selected learning process is general in type.

Experimental Studies in Memory. E. F. MULHALL, Vassar College.

This paper is concerned with the following questions: (1) Does the person who *recalls* one material well also *recognize* that material well?—*i. e.*, is there any correlation between recall and recognition? (2) Does the person who *recalls* one material well, also recall another material well?—*i. e.*, is there any correlation between the recall of different materials? (3) Does the person who *recognizes* one material well, also *recognize* another material well?—*i. e.*, is there any correlation between recognition of one material and recognition of another material? (4) Are there sex differences in achievement in recall and recognition? (5) Is there any difference in sex variability? (6) Is there any difference in the scores of the children of different ages and grades for recall and recognition?

The results are based on six memory tests: recall of words, geometrical forms, nonsense syllables, and recognition of the same. These were given to 285 boys and 353 girls in grades 4-*A* through 8-*B* in a large city public school. The results were as follows: (1) The average of all coefficients of correlation between recall and recognition is .21. Thus it seems that a person who recalls well may or may not recognize the same kind of material well: we know little about one's score for recognition from his score for recall, and *vice versa*; (2) the average of all the coefficients of correlation for recall is .09; (3) the average of all the coefficients for recognition is .18, thus showing that a person who can recognize one material may not recognize another well (the coefficients are about the same for the different materials of the above tests); (4) there is probably little or no sex difference in achievement; what difference there

may be is not in the processes of recall and recognition; (5) no marked sex difference in variability is present; (6) the results show an improvement in both recall and recognition, varying somewhat in degree according to material and process, from grade 4-*A* through 8-*B* regardless of age, and from age nine through sixteen regardless of grade within this range. Further analysis of the data seems to indicate that both age and grade have an influence, probably age especially.

Alleged Elements of Waste in Learning a Motor Problem by the "Part" Method. L. A. PECHSTEIN, University of Rochester.

When a motor problem of the maze type is used as a basis of test, it can be demonstrated that several factors generally supposed to condition the waste found in learning rote and logical material by the "part" method fail to operate. Chief of these alleged causes failing to render the "part" method inefficient in the motor field are as follows: Loss due to negative transfer in the learning of the motor units; loss due to disintegration through time; loss due to retroactive inhibition; loss due to contiguity of unit functioning; loss due to unit incompatibility in a larger series. The weakness of the "part" method occurs in the complex act of connecting the several motor units. The disturbing factors here are statable in the spatial and temporal series. When the connecting act is properly controlled, the "part" method of learning becomes not only equal to, but far surpasses the "whole" method. This generalization is made solely for the motor problem of the maze type, though it bears important implications for any motor activity and also for the mastery of rote and logical material.

Simultaneous vs. Successive Association. SVEN FROEBERG, University of Michigan.

In a recent paper Wohlgemuth presents some experimental data in support of the theory which holds that association is always between simultaneous experiences. When association appears to be formed between two successive experiences the assertion is made that it is in reality formed between the succeeding experience and the disappearance phase of the preceding one. The theory is regarded as proved because the results seem to indicate that simultaneous presentation is more advantageous than successive for the learning of paired associates. Since certain features of the work seem open to criticism, such as questionable assumptions

and the large P. E., it was considered worth while to repeat the experiments with various material and different methods. The results seem to point to the opposite conclusion, namely that successive presentation is more advantageous than simultaneous, provided the succession is immediate.

The Doctrine of the Stages of Consciousness. R. M. OGDEN, Cornell University.

In the solution of problems concerning number of sides and angles of polygons, Ernst Westphal has differentiated five stages of consciousness, as follows: (1) The result of the task is "given" in consciousness (*bewusst gegeben*); (2) the object is noted (*beachtet*) from the point of view of the task; (3) the object is potentially known, though unexpressed (*potentielle Wissen*); (4) the object is known, and the knowledge formulated (*konstatiert*); (5) there is also a lower stage than the first when the result is not given at all, but only the data from which it is obtained (*erschliessbar*).

Since Westphal's analysis is experimentally restricted to the problems of his investigation, it considers only the envisagement and solution of certain tasks, primary and secondary, which the instruction has set. In the interest of a more general psychological interpretation we may revise his stages into the following: (1) *Simple presentation*, embracing essentially the contents, sensory, imaginal, etc., registered, however vaguely, at any moment of consciousness, but without reference to directive tendency or mental activity other than possibly that of free association; (2) *awareness*, which is effected by act of attention, and is registered as a clarification of the contents acted upon. Varying degrees of clearness may result; (3) *knowing*, which as Westphal has shown may achieve different stages of fullness and completeness. The precise number of stages depends upon the nature and urgency of the problem, but all may be said to arise from the unique *act of relating*, whereby the task or point of view influences the correlation and unification of certain contents into a meaningful whole.

Contents of mind must first be presented. Attention must then be aroused before further action upon them can be had. Attention may be conditioned in an objective or sensory fashion; it may likewise result from tasks previously defined in consciousness. The degree of clearness is irrelevant so long as the content or contents to be related emerge at all. The relating activity bears upon those which emerge and are relevant to the problem or

problems at hand. The amount of work done, varying from mere envisagement of parts as formally available, to the definite establishment of a judgment, formulated and expressed, is a matter of the precise nature and urgency of the issue.

Auditory and Tactual Illusions of Movement. H. E. BURTT, Harvard University.

The work of Wertheimer and Korte upon the kinematoscopic illusion and their explanation of the phenomenon in terms of *physiologische Kurzschluss* between the two regions of the cortex corresponding to the two points in visual space, suggested a study of the same illusion in audition and touch. The similar tactual or auditory stimuli in quick succession in different positions were found to yield the illusory movement from one position to the other. Moreover the same relations between the time, distance and intensity factors that had been found to be operative in producing the optimal effect of visual movement proved to be involved in the present case. For instance, the times of exposure and interval were reciprocally related; increase of intensity of the second stimulus produced the apparent movement in the reverse direction.

The auditory results necessitate a reconsideration of Wertheimer's theory, for the auditory organ is not stimulable at different points as are the retina and the epidermis, and there is no evidence for the correlation of separate points in auditory space with separate regions of the sensory cortex. Yet the same subjective phenomena are manifested in all three sense departments. The writer is inclined to explain the illusion on the basis of the action theory. A sound produces by its binaural intensity difference a motor impulse to turn the head or eyes in its direction. If another sound follows shortly there is a second impulse to turn still farther. The sounds may thus be cortically represented by impulses of different intensity in the motor regions leading to the muscles of the eyes or neck, and when the second stimulus supervenes quickly enough there is a continuity of impulses. A similar factor may well be involved in the visual and tactual illusions. Such stimuli produce impulses to make some muscular adjustment in order to more clearly perceive the source of stimulus. At least Wertheimer's theory is inadequate for the auditory phenomena. The writer hazards the belief that all three forms of illusion are due to a continuity of motor impulses.

Sound Intensity Apparatus. A. P. WEISS, Ohio State University.

This apparatus was designed to investigate those problems in audition in which tone intensity, or loudness, might be considered an important factor. The apparatus will give: (1) a number of pure tones; (2) control of the intensity of the tones; (3) control of the phase relations in which the sound waves reach the ear.

The system consists of (1) batteries, (2) rotary converter, (3) regulating fork, (4) interrupter disks, (5) tone forks, (6) resonators, (7) timing device.

The storage batteries drive the direct current end of the converter. On the converter shaft are mounted a series of interrupter disks which furnish interrupted currents of various frequencies. These currents pass through the magnets of the tone producing forks which thus vibrate without the contact noise of the ordinary electrically driven fork. The alternating current generated by the converter is used to regulate the speed of the converter so that the angular velocity is practically constant. For this purpose a regulating fork is used which opens and closes the alternating current circuit in such a way that it acts as a variable load which either retards or accelerates the converter.

Any number of tone forks may be driven at the same time and the phase of the forks can be determined by the relative positions of the interrupter disks. The tone forks are mounted on a heavy iron frame and vibrate silently and continuously. To produce a tone a resonator, properly tuned, is moved near the fork and the distance of the fork from the resonator determines the intensity of the tone.

The mouth of the resonator is opened and closed by a shutter which may be controlled magnetically, either by pressing a key or by a timing device. In this way the duration and order of presentation is brought about.

Some Experiments in Motor Reproduction of Visually Perceived Forms. G. R. WELLS, Oberlin College.

A series of somewhat complexly curved figures was presented to the subject by means of the Whipple tachistoscope. The subject was instructed to call for the smallest number of presentations which was necessary to enable him to be sure that he could reproduce it on paper, being urged to make the number of presentations as small as possible. Immediately after the presentation of a figure in this manner the subject reproduced it with pencil and paper.

There were two sets of figures so studied, and they were reproduced under different conditions, as follows: (*A*) The figures were drawn on paper in full sight of the subject; (*B*) the figures while being drawn were concealed from the sight of the subject. In all other respects the conditions under which "*A*" and "*B*" were performed were identical.

Twenty subjects were used. Care was taken that a practice effect did not prejudice the results. Half the subjects reproduced by the "*B*" method the figures which the other subjects reproduced by the "*A*" method, and *vice versa*. Each subject, therefore, worked in both ways. It is shown that the results of the "*B*" method of reproduction are superior to those of the "*A*" method: (1) in total average results, when the performances are scored according to a carefully arranged system of evaluation; (2) in the actual number of subjects whose performances under the "*B*" conditions are better than under the "*A*"; and (3) in the reports of the majority of the subjects as to the relative ease and satisfaction of working under the two conditions.

The Spatial Differential Threshold for Finger Span. H. S. LANGFELD, Harvard University.

The threshold was obtained for the perception of differences in the size of an object grasped between the thumb and forefinger as given by the sensations of touch, muscle, tendon and joint. Sensations of movement were made constant and thus ruled out as a factor. The instruments used were specially arranged calipers. Six subjects took part in the experiments. Practice effects were almost eliminated by six months' preliminary training. The method of constant stimuli was employed and the threshold calculated according to the $\Phi(\gamma)$ hypothesis. For purposes of comparison three methods of presentation of stimuli were used on all the subjects: (1) The standard and comparison distances were grasped successively by the right hand; (2) the two distances were grasped simultaneously, one by each hand; (3) the two distances were grasped successively, first by one hand, then by the other. The thresholds under these three conditions were calculated separately. Comparatively large individual differences were discovered. A further object of the experiment was to ascertain the degree of correlation between accuracy and confidence. For this purpose the subjects graded their judgments according to the degree of subjective certainty. Beside finding the individual characteristics

in this respect, it was also possible by using these data to analyze the distribution of the various degrees of certainty over the right and wrong judgments, and for the different degrees of objective difference. When the subject reported a mere guess on equality judgments, he was forced to guess one way or the other. The results of these judgments showed the effect of unconscious factors.

A New Method with the Complication Experiment. K. DUNLAP,
Johns Hopkins University.

The present method of working with the complication-experiment is one I tried in rougher form several years ago, and for which I have been building improved apparatus during the last two years. It consists essentially in either (1) illuminating the dial of the complication-apparatus intermittently, or (2) interrupting the visual impression the observer receives from the constantly illuminated dial. When the light-period, as compared with the dark-period, is short, the observer, fixating some point on the dial, sees the moving index-hand sharply outlined at a series of positions, whose spatial separation is governed by the rate of intermittence. If the observer's eyes move, not only the positions of the index-hand, but also the marks on the dial become badly confused, so that the observer finds fixation the only easy method, instead of the reverse as in the old method with continuous vision of the dial. For use by the new method, an improved complication-clock, motor driven, has been built. By means of a vernier scale, the discrete stimulus can be set with great accuracy at any point in the circle of rotation. A sound stimulus which is *single, short*, and does not vary with speed, is produced by the aid of the automatic relay which was built for this work.

The procedure so far found most satisfactory, is to keep the illumination of the dial constant, and interrupt the observer's vision. For this purpose, a special revolving shutter has been built, consisting of two discs closely approximated on a common axis, each having two adjustable apertures, and revolving in opposite directions before the observer's eyes, so that the two eyes are exposed simultaneously. As the intermittence reduces the brightness of the visual image, the dial is illuminated by a nitrogen lamp of sufficient intensity.

The oldest method of observation is used, *i. e.*, the sound stimulus is set at a certain point, and the observer is required to judge what this point is. The apparatus is designed to be used ultimately with

both Burrow's method and Klemm's method, but attachments for these have not yet been put on.

The absolute exclusion of eye-movement by the above-described method of course does not in itself abolish the normal illusion, since there is still a reaction by which one position of the pointer is picked out. But the abolition of the illusion is made easy, and the only change from my earlier conclusions is that the reaction which fails to synchronize with the sound is not necessarily an *eye* reaction.

The Synthetic Method in the Study of the Behavior of the Higher Vertebrates. W. CRAIG, University of Maine.

In order to understand the behavior of a single species of animal, the psychologist may well devote his entire time to the study of that one species. Doing so, he finds that he must apply a great variety of methods, even of separate sciences. For example, a study of the behavior of doves, in order to be at all complete, must include not only the customary investigation of the senses, reflexes and instincts, intelligence, and a good deal of physiology, but also ecology, life histories studied in the field, individual histories studied in the aviary, development and education of the young (with interpretations in the light of child psychology), emotional behavior, language, music, social behavior, sex behavior, "mental mechanisms," valuation, and other studies. The need and the justification for each of these studies in bird behavior are shown concisely in the complete paper. All these phases of behavior are so intimately interrelated as to constitute one complex whole. Any single reaction may involve many of the phases of behavior here mentioned, and be an integral part of the bird's whole life. By studying only one phase of behavior, *e. g.*, in one problem box, the observer may reach fundamentally wrong conclusions, because of not understanding his subject. Of course there must be specialists on certain methods and apparatus, to develop each to the highest perfection. But there should be other specialists, who choose the synthetic study of one animal. For animals, like persons, are individuals, and they need to be understood as such.

The Grasping Reflex in Infants. J. B. WATSON & J. J. B. MORGAN, The Johns Hopkins University.

Arrangements have been made in the psychological laboratory at the Johns Hopkins Hospital for an extensive study of the reflexes, instincts, and early habits of the human infant. The

grasping reflex has so far yielded the most rapid results. Several hundred observations have been made upon children ranging in age from a few hours to two or three months. The grasping reflex is present in all but exceptional cases. A measure of the strength of the reflex has been made. Most infants lying on the back are able to cling to a rod with either the right or left hand until the full body has been lifted, and to maintain this position for an appreciable time. If the infant is very heavy the complete weight cannot be lifted, although the grasping reflex is present in the heaviest babies. The factors entering into its modification have not yet been sufficiently studied. The reflex cannot be looked upon as atavistic in any degree; but on the contrary as an important and fundamental mode of response; one upon which varied habits of manipulation are grafted. The reflex seems to give way *pari passu* with the putting on of habits of manipulation. There is some slight evidence to show that it persists for a longer period of time in cases of underfeeding than in normals.

Distribution and Elimination of Errors. H. A. CARR, University of Chicago.

The average temporal order in which the various *cul de sacs* were eliminated was determined for nine mazes. This order was correlated with that representing the spatial proximity of the *cul de sacs* to the food box. Positive values were obtained for six mazes and negative values for three. The *cul de sacs* were now arranged in an order representing the number of entrances for successive stages of learning. This order was correlated with the temporal order of elimination. Negative values were invariably obtained for all mazes and for all stages of mastery. The difficulty in mastering any *cul de sac* is a function of the frequency with which it is entered; elimination must be explained to a large extent in terms of the distribution of errors. Some of the factors determining the relative frequency of entrance into the various *cul de sacs* are the returning tendency, changing motives, and the character of the maze habit.

The Discovery of Autistic Thinking During a Memory Test. C. S. YOAKUM, University of Texas.

In a preliminary study of an experimental problem, we had occasion to use the Binet letter squares to establish individual norms for immediate memory. One subject showed the greatest pleasure

in this mechanical work. A chance remark led to the discovery that every card, each card containing twelve consonants, recalled a "story" and the consonants acted as "cues" for different parts of the "story" thus revived. Although only twenty seconds were allowed in which to memorize each card and over one hundred cards were used, yet less than thirty per cent. of the "stories" were repeated and this subject made 98.7 per cent. of a perfect score. In these "stories," we find a series of individual fancies and experiences that correlate and form a picturesque life history unrelated to the subject's usual activities. The main objective evidence for this inner group of thoughts lies in an extreme emotional impatience when certain topics are broached and in the pleasure accompanying memory tests. Further study shows that this emotional impatience occurs when some situation is presented in which the subject cannot participate because of "ideal" formulations that conflict. As soon as the subject is fully aware of the instinctive tendencies that are in arrears and realizes clearly that others are unsocially developed, the change in behavior begins. Independent sources of information show that such a change has occurred in this subject. Her childish voice is changed; her petulance is lessened; her resistance to non-imaginative experiencing has changed to a curiosity that leads her to try out actual activities.

A Theory of the Origin of Delusions of Persecution. T. H. HAINES, Columbus, O.

The history is of a robust male who came into the care of a hospital for the insane at thirty-four years of age on account of his systematized delusions of persecution by the father of a fraternity brother. The persecutors had pursued him half way around the earth repeatedly, and in many different positions in life. These delusions seem to have originated in an inherent defect in his character, which lies in the conative side of his nature. The patient is intelligent but apparently constitutionally incapacitated for carrying through to completion anything to which he sets his hand. He hated to finish things even as a boy. The patient's first serious break with himself occurred when he was twenty-four. He left his place where he had been for six years, and without any plan for the future, because he could not earn enough to support the girl he wished to marry. Soon after this he broke his engagement and went to the Philippines. There he became aware of persecutions of the "old man," father of his friend, in an eastern city in

the United States. He believed this man was using his powerful relations in business, church, and government circles to spread the word that the patient was sexually incompetent. This persecution became so hot that he left the islands. Insinuating references were made to him in an entertainment on shipboard. His fraternity opposed the financing of his scientific expedition. He tried theology. He secured a quiet position in a museum. He had to change from each of these. He could not live alone in the old family home. All along he insisted he was to be married to his former fiancée, though he knew full well she had married another. This patient appears to be perfectly normal except for these delusions and his contentment with confinement.

Analyzing his mental makeup we discern: (1) *Lack of persistence of purpose*; (2) emotional inconstancy (a cyclothymia); (3) depression at times, sometimes very irritable and quarrelsome; (4) mental *awkwardness* and morbid introspection; (5) *realization* of his social and economical incompetence, which proceeds from mental awkwardness and lack of persistence of purpose. In order that his subjective world shall be consistent and unified, the patient must see the real cause, or hypostatize another. He has too much ambition and self-esteem to assume responsibility for the abortions of his career. He is, therefore, driven to invent his persecutors as a *defense* for (explanation of) his character defects.

*Personality as Revealed by the Content of Images.*¹ L. J. MARTIN,
Stanford University.

The aim of the present investigation was to ascertain whether it is possible through the examination of the content of an individual's images to obtain an insight into the predominating features of his personality, that is, the psychical and physical activities which characterize and distinguish him from others.

The experiments of Series I were made by the visual image method, and those of Series II by the feeling image or reinstatement method. In half the experiments of each series, the images were spontaneous, that is, the observer allowed them to arise of themselves, and in the other half he used his will in arousing them. Naturally the method was *unwissentlich*. Twenty observers took part.

¹ Summary of the address given by the retiring Vice-president and Chairman of Section H, Anthropology and Psychology, American Association for the Advancement of Science, New York meeting, December, 1916.

Opinions based upon the experimental results as to the observer's mental and physical activities are confirmed by what has been published concerning him, by his general reputation in the community, by what his intimate friends say of him, by my knowledge of him and by his own opinion expressed after the experiments were completed. The results everywhere show that images are not isolated entities, but are closely bound together, supporting and supplementing each other as information bearers and for this reason one gets, through taking images apparently at random, typical examples of the entire range of an individual's imagery. Stated briefly, the results show that the image method is a mode of "sampling" which is adequate for a diagnosis of a personality. Both of the above series are needed in making such an investigation, for in some cases emotions transform major image centers into minor, and *vice versa*. Moreover, feeling has an energizing and a non-energizing effect on thinking and acting that must be taken into account. Supplementation and modification of Series I and II would be desirable, as, for example, the effect on imagery of shifting the environment systematically. Again, experiments where the experimenter suggested the subject of the image would throw light on the initiating thought power of the observer. Experiments were also made by the association method. The results showed that the image method yielded much more information concerning the personality of the observer.

An Experiment in Vocational Selection. W. D. SCOTT, Carnegie Institute of Technology.

The adequacy of a vocational test is determined by checking it with some recognized standards. Three such standards were presented at the annual meeting last December. A fourth standard has been used as a further check and has served to corroborate the results secured from the other three standards.

In a selling organization over 85 per cent. of all new men failed and resigned annually for a period of several years. During the last two years groups of applicants for these selling positions, after having been recommended for appointment, were submitted to a series of tests. During the same period and in the same territory other groups were tested composed of those who had been successful in selling in the same territory. A comparison of the accomplishments of the candidates, most of whom fail, with the accomplishment of the successful salesmen indicates the adequacy of the tests for differentiating the two groups. This particular standard of

comparison is ordinarily available and offers a rough and ready method of testing tests.

PAPERS ON EDUCATIONAL PSYCHOLOGY

Experiments with Different Types of Readers. C. T. GRAY, University of Texas.

It is the purpose of this paper to present some of the results of an investigation in which different types of reading were studied by means of various tests and experiments.

The subjects were only sixty in number (that the work might be intensive rather than extensive), distributed through the various elementary school grades, from the third to the seventh. In addition to these, other persons were secured from the different high-school grades, and also from the various classes in college. For the purpose of measuring oral reading ability Gray's *Oral Reading Scale*, which consists of twelve short selections, was used. In addition to this, three poetical selections and one oratorical selection were used. In giving these tests, the time was recorded and all mispronunciations, omissions, repetitions, insertions were noted. In addition to the above points, a grade was given upon interpretation, poise, pitch, emphasis, force, and articulation. Silent reading was tested by having the subject answer questions upon the material read, by reproduction, by outlining, by a test in rapid reading, by a direction test, and by a newspaper test. A very important point suggested by this part of the work is that there are different methods of reading which vary with the purpose which the reader has in mind while reading.

The experimental work included both perception and motor tests. The perception tests consisted of: (1) Short exposure work with both sense and non-sense material; (2) voice-eye separation test in oral reading; (3) test for determining the relation of the focus and margin of attention in silent reading. The motor tests were as follows: (1) Rate of vocalization; (2) amount of vocalization in silent reading; (3) relation between breathing and oral reading; (4) eye movements.

The work in perception may be summarized in the one statement, that there is a high correlation between the span of attention and the rate of reading. That is, the slow reader usually has a short span of attention, while the fast reader usually has a much greater span than the slow reader. That part of the work which was devoted to eye movement shows clearly that there are different

types of rapid readers, and that the regressive movements may indicate a method of reading.

An Application of Standard Measurements of Achievement in School Work to a Group of Delinquent Women. M. A. CLARK, Laboratory of Social Hygiene.

In this paper are presented the results obtained from a series of standardized tests in school subjects given to 100 delinquent women at the time of their admission to the New York State Reformatory for Women at Bedford Hills. The series included the Thorndike Reading Scales, A and Alpha, the Kansas Silent-Reading Test (Kelly), the Courtis tests in arithmetic, a list of words selected from the Buckingham Spelling Scale, and the Trabue Completion-Test Language Scales.

The correlation of these tests with one of the modifications of the Binet Scale, which had also been given to this same group, was worked out as an indication of the relation between achievement in school work and native ability. As an indication of the relation between present capacity in the various school subjects and the amount of school training which a given individual had received, the ratings of the women in the tests are compared with the grades which they had made in school, and also with the number of years which they had taken to cover a given number of grades.

The Relative Value of $6\frac{1}{2}$ Minutes vs. $4 + 2\frac{1}{2}$ Minutes in Studying a Page of History. A. S. EDWARDS, University of Georgia.

Classes in high school and grammar grades were divided on the basis of school grades in history by the teachers. Half of each class was a review group; half a non-review group. The non-review groups studied $6\frac{1}{2}$ minutes, wrote 12 minutes and took an examination from ten to twelve days later. The review groups studied 4 minutes, wrote for 12 minutes, and about 5 or 6 days later reviewed $2\frac{1}{2}$ minutes. They were examined five or six days later. In order to check the factor of recency, part of the non-review groups studied when the review groups studied, and part studied when the review groups reviewed. The total amount of time was thus the same for all. It is found that the review groups were without exception better in reproduction. In the experiments in which the non-review group studied when the review group *studied*, the review group reproduced nearly twice as much per pupil as the non-review group. In the experiments where the non-review group

did their study of $6\frac{1}{2}$ minutes when the review group had their *review*, the review groups reproduced per pupil as high as fifty per cent. more than the non-review group. All papers were graded in exactly the same way according to plan so that the results should be strictly comparable.

The Problem of Handedness in Education. W. F. JONES, University of South Dakota.

Out of 10,000 persons 417 are born left-handed, 9,853 are born right-handed; 4 per cent. of the race are left-handed, 96 per cent. are right-handed. Out of 417 born left-handers, 323 shift to the right-hand. 77 per cent. of born left-handers adopt the minor arm. Out of 417 born left-handers 4 are shifted by accident, 1 per cent. of all left-handers; 319 are shifted by purposive interference; 94 are allowed to use the major arm. Out of 9,583 born right-handers 96 are shifted to the left hand, 1 per cent. (accident). 419 persons (323 plus 96) out of 10,000 adopt the wrong arm, that is, one person out of 25 is using the minor arm.

Conclusions from skill tests of the three types of handedness are: (1) The pure left-hander reveals no less skill than the pure right-hander; (2) the shiftover is regularly deficient in hand and arm skill though the average skill of his two hands is equal to the average skill of the two hands of the right- or left-hander, he has two minor hands and arms rather than one dextral and one minor; (3) it is possible to shift back to the major arm if the shiftover does not show a muscle swell of minor arm exceeding that of the major (born) arm, and if the shiftover is below adolescence the back-shift should be made.

The Learning Curve Equation. L. L. THURSTONE, Carnegie Institute of Technology.

The learning curve equation is an attempt to state the learning process of any single individual for any particular kind of material as a law, expressed in the form of an empirical equation. About forty different equations have been tried and among these one form of the hyperbola seems most available both from the standpoint of satisfying learning data and from that of ease in statistical manipulation. The equation, so selected, takes the form $y = [a(x + c)] / [(x + c) + b]$, in which x = *formal practice* in terms of the total number of practice acts since the beginning of practice or a multiple thereof, y = *attainment* in terms of the number of successful acts

per units of time, or a multiple thereof, c = *equivalent previous practice* in terms of units of formal practice, a = *physiological limit* in terms of attainment units, b = *rate of learning*, a pure number, expressing the rate at which the physiological limit is being approached.

$v = \Sigma(d)/n$, in which v = *variability coefficient*, d is the deviation of the individual learning scores from their theoretical values as determined by the equation, n is the number of observations.

A high variability coefficient indicates an erratic learning subject, a low variability coefficient indicates a steady improvement in the learning function.

It should be noted that each one of these four coefficients is based on all the observations combined, and that by substituting their numerical values in the learning curve equation we obtain a general law for the learning process.

The applications of this statistical procedure are perhaps obvious. By means of it one may attack scientifically such questions as the prediction of the limit of practice from a limited number of observations, the relationship between the rate of learning and the limit of practice, the relative effectiveness of different learning attitudes, concentrated versus distributed effort, all the classical problems in memory, and the relative effectiveness of teaching and learning methods wherever attainment can be quantified.

PAPERS ON MENTAL TESTS

The Evaluation of a Method for Finely Graduated Estimates of Abilities. J. B. MINER, Carnegie Institute of Technology.

Estimates on general ability, and five more specific traits, common sense, energy, initiative, leadership, and reliability were obtained for each senior at Carnegie Institute of Technology from members of the faculty who knew him best. The estimates were made in terms of fifths of a defined group with the opportunity for finer grading within these five steps of the scale by means of a dot placed on a standard line divided into fifths. The results show such agreement of two judgments with two others on the same students that it seems not to be necessary to have all of the group estimated by the same judges. How fine grading is desirable was determined by the coefficients of reliability. The records afford the employment office information to supplement scholarship ratings. Certain relations of the estimated abilities have been meas-

ured. It is proposed to correlate them ultimately with records of the success of the graduates.

A Dissected-Story Test. K. GORDON, Carnegie Institute of Technology.

An anecdote, sixty words long, was cut into eighteen parts. These parts were pasted on separate cards and spread on a table in a certain incorrect order. The subject of the test was directed to re-arrange them as quickly as he could, so as to make out of them a consecutive story. The exercise seems to test a certain facility in language, and a readiness in making and breaking combinations of ideas. It has been given individually to 78 college freshmen girls, and to 17 college instructors, of whom 9 are women and 6 are men. The time of performance ranges for the students from 80 to 1,320 seconds, the median being 306 seconds. The range for the instructors is 89 to 302 seconds, the median being 189 seconds. In the case of 47 students it was possible to compare rank in this test with an amalgamated rank from six other tests, with the result: $r = .60$.

A Graded Series of Dovetail Puzzles. G. H. KENT, Grafton, Mass.

In view of the number and variety of mental tests that have appeared during the last few years, it is fair to raise the question whether the practical value of these devices is sufficient to justify so great expenditure of effort. In the clinical field the results are disappointing; but this may be due to our tendency to expect too much. At least, the test is useful for tentative classification of subjects who are waiting their turn for a more thorough examination. In my work among insane subjects I have found non-verbal tests more serviceable than tests requiring a verbal response, because the former are applicable to patients having no knowledge of English, to aphasic patients, to patients who cannot be induced to speak, and to patients whose speech is too incoherent to be intelligible.

This series of puzzles is offered as a means of measuring mechanical ability of a certain type and determining to what extent this ability depends upon special training. One need not take time to allow the subject to solve all the puzzles of the series, for the ability which is measurable by this method can usually be determined by the use of two or three puzzles. The extremes of the series will be used comparatively little, but they are necessary in

order to give the test a wide range of applicability. It is possible, if desirable, to extend the series still further.

No attempt will be made at present, if at all, to standardize this test. Standardization is not essential to the usefulness of a test, because the user will probably rely quite as much upon his own experience as upon the standard. Furthermore the standard may be misleading, as it has a tendency to call our attention to the averages of groups to the disregard of variations within groups. In any event, standardization is a matter for collective rather than individual effort, since it requires the coöperation of many persons who are not concerned with the results. I do not feel justified in asking for so much assistance until I have strong evidence that the test is worthy of being standardized, and I think it advisable to refer this question to some person less biased than the originator of the test. The present indications are that the test possesses possibilities of usefulness in the clinic and especially in the vocational school.

Group Tests for Preliminary Mental Surveys of Institutions and Schools. R. PINTNER, Ohio State University.

A set of six to eight class tests has been standardized and used for preliminary mental surveys of institutions or schools. The tests are: Rote Memory Test, Digit-Symbol Test, Symbol-Digit Test, Word Building Test, Easy Opposites, Cancellation of a's, Directions Tests *A* and *B*.

The tests were given to 88 cases, the population of a children's home. These 88 cases were also tested on the Yerkes-Bridges Point-Scale. The correlation between the ranks of the children on the class tests as determined by their Intelligence Quotient and their ranks on the Point-Scale as determined by the C. M. A. is .80. The practical advantage of a group of preliminary tests is shown by the more accurate selection of doubtful cases by means of the tests than by means of the opinion of the superintendent or teachers.

Six of these tests have been used in two schools, one a school attended by children belonging to the so-called upper middle class and the other by children of the lower middle class and laboring class. An attempt has been made to obtain a rough comparison between the mentality of these two groups of children. The standardization of the tests in the form of percentiles allows a percentile grade to be given to the child's performance on each test. The median percentile of the six percentiles for the six tests

serves as the index for the mentality of the child. The median of these indices for a class gives an index for the mentality of the class, and likewise the median for all the children in the school gives an index for the mentality of the school. Grades 2 to 6 inclusive were tested in each school, comprising in all 773 children. The class medians of the first school were in general slightly above the class medians of the second school. The median index for the whole school was in the first case 59 and in the second 50.

A development of this method will lead to a better measurement of the mentality of large groups. It is the writer's belief that the results of educational tests in the future will have to be evaluated in terms of the mentality of the children tested. A school with children of poorer mentality cannot be expected to achieve as good results as a school with children of superior mentality. Conversely a school having children of better than average mentality ought to accomplish better than average educational results.

The Mental Level of a Group of Immigrants. H. H. GODDARD,
Vineland Training School.

Mental tests of 185 immigrants tested upon their arrival at Ellis Island. Tests used: The Binet-Simon Scale, the De Sanctis tests, Healy Construction Puzzles *A* and *B*, the Adaptation Board, the Form-board. Experiment to answer questions: (1) Can mental tests be used under such conditions? (2) If so, what is the mentality of immigrants? Possibility of giving the test by means of an interpreter. Evidence fairly satisfactory that this method does not invalidate the work. Several methods employed for interpreting the data.

Attempts to standardize the Binet Scale on the group itself by determining the questions of the Scale that are answered by 75 per cent. of the immigrants, and comparing those who fail with this standard. Second, assuming the Scale valid, the results give a very high percentage of morons. Discussion of the question, "Is it possible that this is true?" Facts showing that as a matter of fact many immigrants are treated as morons, that is to say, recognized as out of their environment, needing special care, employing them in menial work, excusing them on account of their language, and other practices the same as those used with morons. The question of heredity as related to the problem. The study of the other tests used with statement as to the extent to which they corroborate or contradict the findings of the Binet Scale.

The problem is a difficult one on account of the conditions under which the immigrants arrive in this country, but the conclusion seems warranted that mental tests have at least a limited application to the problem and undoubtedly with more study this might be increased until they became fairly satisfactory.

Notes on the Use of Certain Binet and Related Tests on College Students. E. MURRAY, Wilson College.

The original purpose of this study was the gathering of evidence relative to the popular belief that the Binet tests are too difficult for the average adult. Later, the relation of the scores of these and similar tests to academic ability was made the object of investigation, with a view to the ultimate utilization of these results in the advising of college freshmen, and in estimating the causes of academic failure. The tests selected for study were weight-discrimination, line-suggestion, sentence, digit, and diagram-memory from the Binet series; supplemented by the Fernald-Healy construction puzzles, the Knox-Pintner imitation test, an incidental memory and object pairing test (Ellis), and a handwriting-pairing test. The subjects were twenty-eight college women of the junior class, whose ages averaged twenty years and six months.

The average scores, though by no means the maximum attainable, are, in general, superior to those of children. There is, further, a positive correlation of .70 between class rank based on a composite score for all eleven tests and rank based on academic grades covering three years. The highest correlations for single tests are those between digit memory and grades (+.47), and incidental memory for objects and grades (+.46); the lowest, that between Construction Puzzle B and grades (-.03). There is also a high positive correlation (.68) between composite test score rank, and composite class estimate of its own ability, whereas the corresponding correlation with instructor's estimate is +.48 (with the average of two instructors' estimates, +.54). On the other hand, the correlation of a group of six controlled association tests with grades is +.50, with class estimate +.55, with instructors' estimate +.60. The relation, therefore, in which the eleven tests stand to grades, to class and to instructors' estimates is apparently inverse to that obtaining for controlled associations. These figures are, however, subject to certain criticisms, and, pending the repetition of the tests with certain refinements of method and of scoring, any conclusions as to the relative significance in academic problems of

tests of the clinical (or practical performance) and verbal (or logical) association type would be premature.

Mentality Testing of College Students. W. V. BINGHAM, Carnegie Institute of Technology.

The demand for psychologists to turn seriously to the task of testing undergraduates arises from the need of supplementary means of selecting from among the applicants for admission; of classifying students according to ability; of adjusting the curriculum to the peculiar needs of the individual student; of adjusting the student to the curriculum through adequate diagnosis of the causes of his failure to do good work; of assisting the employment office in placing the seniors in the right positions; and of measuring the results of instruction.

The well-nigh baffling problems which confront the psychologists who undertake to meet this demand include the devising and adapting of tests and of sound and convenient statistical methods; the standardization of procedure in giving the tests; the calibration of the tests, or the determination of the best methods of scoring; the accumulation of norms and the establishment of boundary lines and zones; and finally, the evaluation of the tests as regards their relative reliability, convenience and practical significance, and the interpretation of the results through studies of their correlation with instructors' estimates, class standing and other measures of ability. The manner in which these problems are being met is illustrated by reference to the results of recent researches, particularly at the Carnegie Institute of Technology.

University Instructors Tested by the Stanford Scale. J. E. DOWNEY, University of Wyoming.

In connection with a study of the Stanford Adult Tests a group of thirty members of the University of Wyoming faculty was examined. The following points were considered: (1) Does the faculty group as a whole, when rated in terms of *I Q*, show a higher central tendency than does a group of college freshmen or of upper classmen? (2) What irregularities in the results of scale-testing appear when these are correlated with the judgments passed on these faculty members by their colleagues? (3) What particular character traits that need to be measured for vocational purposes are thrown into relief? (4) Do differing degrees of success in the tests primarily verbal or constructive (concrete) appear for different departmental groups within the faculty?

The results indicate that the faculty group tests considerably higher than either of the student groups. The median *I Q* is 113, while the median for the same number of freshmen is 104.1. Only one instructor tested below seventeen years, which Terman places as the lower limit of the superior adult. Some interesting discrepancies occur, however, between the judgments of their colleagues and the ranking of the faculty group on the basis of the *I Q*'s. A reputation for great fluency of speech, for example, does not guarantee an unduly successful handling of the vocabulary test. It is possible to guess at meanings with great social effectiveness, though insufficiently successful when measured by dictionary requirements. Three character traits seem especially to serve in augmenting achievement and, hence, reputation: (1) Energy; (2) Persistence; (3) Assurance. Indirect evidence of the degree of presence of these traits appears in the examination. Some definite groupings on the basis of success with the verbal or construction tests were indicated by the results. The most noticeable difference between the scientific and literary group was, perhaps, objectivity versus subjectivity of attitude. The former was glad to try out the tests as a matter of general interest; the latter submitted to the tests with greater reluctance and as individuals were more interested in their personal records than in the general principles involved. The rapidity with which the test was completed also proved somewhat significant. With the same examiner the range was from thirty-five minutes to one hour and forty-five minutes. The executives among the faculty showed the greater rapidity, with or without accuracy, of decision.

A Detailed Study of Whipple's Range of Information Test. J. C. BELL, Brooklyn Training School for Teachers.

The test was given to 596 college students, distributed as follows: 81 seniors, 59 juniors, 84 sophomores, and 372 freshmen. The students were asked to place before each of the 100 terms on the test sheet the letter "D" if the term could be accurately defined, "E" if its use could be explained, "F" if it was only vaguely familiar, and "N" if it was entirely new. The score on each term was computed for each class of students, and the terms then arranged in decreasing order of familiarity.

In order to determine somewhat more broadly the proficiency of students in different fields of information, the terms of the test were collected into nine groups, as follows: 1. History and litera-

ture (12). 2. Language, including musical, social and household terms (11). 3. Philosophy, including education, politics and theology (11). 4. Physical sciences and mathematics (17). 5. Biological sciences (12). 6. Anatomy, physiology, hygiene and psychology (8). 7. Arts and manufactures (15). 8. Business (7). 9. Sports and games (6).

The percentage of familiarity with each group of terms was then computed for each class, and comparisons were made on the basis of increasing college experience. In the case of the seniors the greatest familiarity was shown with the history and literature group, followed closely by the business, the physical science and the philosophy groups. The arts and manufactures, anatomy, and biological science groups fell much lower, the latter group showing only a little more than half as high a percentage as the highest group.

Point-Scale Coefficients of Intelligence. R. M. YERKES, Harvard University.

The Yerkes-Bridges point scale, as first proposed, was intended for application to children over three and under fifteen years of age. The results of several thousand examinations have proved that its reliability diminishes rapidly toward the extremes of this age range. It seems to us most satisfactory between the ages of seven and twelve. Because of this, we are supplementing the original scale by two additional scales, the first to be known as the infant scale, the other as the adolescent-adult scale.

In each of these three scales, twenty tests will appear, each graded in difficulty so that the credit given may be proportional to the reactive capacity. For each test, norms will be made available so that any and every test of the groups may be used either separately or as part of a scale. With use the number of tests common to the three scales will increase and the scales will tend to fuse.

The purposes of these three intimately related point scales are: (1) To determine intellectual status for all ages or degrees of development between two and one half or three years and maturity; (2) to differentiate between high grade intellects; and (3) to supplement the measure of intellectual status by more detailed and specific descriptions of intellectual constitution.

The coefficient of intelligence originally suggested as a convenient method of expressing the general result of a point-scale examination may be defined as the ratio of the point scale to the

expected score or norm. It is not directly comparable with the intelligence quotient of the Binet scale, and anyone who designates the point-scale result as a quotient or the Binet result as a coefficient will cause inexcusable confusion and errors of judgment.

The characteristics of the coefficient of intelligence, and its range between the ages of eight and thirteen, suggest the following classification of intellects: Dependent, Inferior, Subnormal, Normal, Supernormal, Superior, Genius.

The Weighting of Point Scale Tests. R. S. HARDWICK, Harvard University.

Since the Point-Scale examination has for its object the measurement of mental ability the tests would be correctly weighted if their scores were proportional to their respective correlations with general intelligence. Our only way of representing a subject's intelligence numerically is by the result of the mental examination. Hence the problem of the correct weighting of the tests must be solved by a series of approximations.

The present scoring of the Point-Scale tests represents a first approximation to the correct weighting. A second approximation would naturally be based on correlations existing between the scores made on the several tests as now given and the total scores resulting. These correlations have been computed for three different age groups of public school children, 53 subjects at twelve and thirteen years, 43 at nine years, and 53 at six years.

From the average values of r for all three groups the "theoretical weighting" was obtained by means of a graph. As some of the tests do not lend themselves readily to the scoring thus determined, a set of "suggested weightings" was worked out as a compromise, nine of them being identical with the corresponding "theoretical" values. These "suggested" scores were then tried out with a group of thirteen records chosen for purposes of illustration. Comparison of the revised scores with the original ones indicates that the correct weighting would tend to lower the total scores.

Comparison of "actual" and "theoretical" scores for the several tests shows three for which no correction is required, and five more for which the correction amounts to only one point. The greatest discrepancy is found in the case of "Reaction to the three Binet pictures" (now too high by 5 points) and "Words in three minutes," "Memory for digits," and "Comparison of remembered objects" (respectively, 4, 3 and 3 points too low). There is a

closer resemblance between the orders of correlation for the two higher age groups than between either of these and the order for the youngest group. "Resistance of line suggestion" and "Choosing prettier" rank low for all three groups.

The Diagnostic Value of Some Mental Tests. C. C. BRIGHAM, Princeton University.

Twenty-three of the Binet tests for the upper years and ten other sorts of tests (tests of memory, suggestibility, puzzle-solving ability, reasoning, etc.) were given to 59 retarded subjects aged 12, 13 and 14 in the special classes for backward and defective children, and to 58 subjects of the same age in the sixth, seventh and eighth grades of the Trenton, N. J., public schools. The retarded group had attended school slightly longer than the normal group (av. time in school = 7.42 yrs.), but had progressed only half as far (av. grade = 3.71). It was impossible to account for the extreme pedagogical retardation of the members of this group or for their presence in the special classes on any ground other than that of intellectual inferiority.

It was found that some tests were equally easy or equally difficult for both groups (the five weights tests, for example, being passed by 70 per cent. normal and 55 per cent. retarded). Other tests were extremely easy for the normal group, but practically impossible for the retarded group (the dissected sentence test being passed by 100 per cent. normal and 29 per cent. retarded). In other words, certain tests were found to be highly diagnostic of intelligence, while others were not diagnostic. It was found that the Binet scale would have been more effective in diagnosing intelligence if 18 of the 23 tests had been eliminated entirely. The presence of tests that are not diagnostic obscures the value of the effective tests in such a way that the same "mental age" may be attained by a normal or by a feeble-minded individual. The diagnostic values of the 30 sorts of tests used varied from 74 per cent. in favor of the normal group to 2 per cent. in favor of the retarded group, so that the tests may be arranged in the approximate order of their value in diagnosing intelligence.

The problem of improving present methods of diagnosing intelligence would seem to be that of discovering tests that are more highly diagnostic of intelligence and substituting them for those that are less diagnostic. An elastic type of measuring scale can be constructed (on the basis of the standardization of individual

tests) in such a way that more effective tests may be substituted at any time, and the accuracy of the whole scale increased without discarding all the norms of previous experimental work.

"Scattering" in the Binet-Simon Tests. E. A. DOLL, Training School, Vineland, N. J.

It has been observed that feeble-minded subjects "scatter" more (*i. e.*, test over a wider range) than normal subjects in Binet-Simon examinations. It also seems evident that this scattering varies according to the etiological types of mental defect. This implies that the individual tests of the Binet-Simon Scale are of unequal degrees of difficulty for normal and feeble-minded subjects of similar mental levels. A new standardization of the Scale, involving several new statistical procedures, is presented, and gives an arrangement of the tests in successive order of difficulty as well as in year-groups. This order of difficulty is significantly different from that which is obtained for feeble-minded subjects. This gives rise to greater scattering for mental defectives, and indicates important qualitative differences in the mental abilities of the feeble-minded. Analysis of the tests which show specific differences for the two groups results in important additions to the psychology of mental defect. The typical distribution of tests passed and failed in Binet-Simon examinations is developed as a significant aid to mental diagnosis.

Some Differences between Normals and Defectives which are not Indicated by Intelligence Tests. F. MATEER, Waverly, Mass.

A mental examination by the Goddard or the Stanford revision of the Binet or by the Point-Scale is a valuable help to diagnosis, and there is but a very small group in which these findings are not sufficient as an indication of the mental features of the abnormality. This exceptional group is the one to which we must look for the solution of the greater number of our problems concerning the defective, and consists of those we call the borderline cases. These are so near the normal that any test of mental level fails to differentiate them sufficiently for an immediate diagnosis or prognosis. The lack of certainty regarding prognosis is complicated by another factor of fallibility indicated by some recent investigations I have been making. These experiments indicate that even the diagnosis of a mental age in the child who is assuredly defective means a very different thing from a diagnosis of the same mental level or age in a normal child.

The difference comes out markedly when we study the scholastic acquirements of two groups, defective and normal, and is also marked in the clinical cases of children who are normal in the mental tests, but who are by other findings defective. One thing which may explain the difference is that the school examinations give us the result of a continued psychological examination of the learning process to which the pupil has been subjected since his first school admission.

The field for exploration here is large, and I can indicate but one or two of the methods which seem feasible. The learning process of the youngest infants, as well as of older children, can be readily studied by the method of conditioned reflexes. This method applied to defectives who tested normal, gave results differentiating them effectively from normals of an unselected group. Another method is the repeated use of any performance test which is fully up to the child's level. We shall probably find that the development of learning norms for young children will bring about a marked increase in efficiency of psychological clinics.

A Comparison of the Binet-Simon Scale (1911 Revision), the Stanford Revision, and the Yerkes-Bridges Point-Scale as Given to Delinquent Women. M. R. FERNALD & M. H. S. HAYES, Laboratory of Social Hygiene.

The comparison here described constitutes part of a longer series of tests given by the authors to 120 committed to the State Reformatory for Women at Bedford Hills. A method was worked out by which we could, with what appeared to us reasonable justice to each scale, evaluate any given test in accordance with the rules for each of the forms used: *viz.*, the Binet-Simon scale, 1911 Revision, in both the form used by Binet (according to Town translation) and that used by Goddard, the Stanford Revision, and the Yerkes-Bridges Point-Scale. In many cases an identical method of presenting and of marking the test was possible for all scales; in some the method of presentation was the same for all, but variation in the grading was necessary; in others certain additions had to be made to the test as given for one of the forms, to make it available for the others; in only a few of the tests were the differences in presentation such that a compromise between the three methods was necessary. In such cases we have given precedence to the form of the Binet-Simon scale, Town translation, and have made the best adjustment possible for the other forms.

Two check series of 50 cases each have also been given, in which the Stanford Revision and the Yerkes-Bridges Point-Scale have in turn been given precedence.

Correlations have been computed between the different forms, and between individual tests in each scale with the total result for this scale. The scores for the various scales have also been considered with reference to the school records of the women before admission here, and with reference to their capacities as shown in the school work of the institution.

On the basis of these comparisons we have considered the question of what should be accepted as the standard of intellectual normality as contrasted with feeble-mindedness. The results vary according to the scale used and the standard applied to the given scale. The significance of these variations is discussed.

A Study of Tests Additional to Those of the Binet Scales as Given to Delinquent Women. M. H. S. HAYES & M. R. FERNALD, Laboratory of Social Hygiene.

This paper discusses the results obtained by the application of thirty psychological tests, not included in the various modifications of the Binet Scale, to 120 delinquent women committed to the State Reformatory for Women at Bedford Hills. The selection of tests was guided mainly by the following considerations: (1) The desire to try out different mental processes; (2) a recognition of the importance of having both tests definitely appealing to language facility and also performance tests eliminating the language factor as completely as possible; (3) the attempt to include both tests which have general diagnostic value and also more specialized tests which indicate only capacity in certain specific lines; (4) the desire to use, wherever possible, tests which have been or are being standardized elsewhere, since our group is not a standard one. We have included in the series seven memory tests, both rote and logical memory, four association tests, both controlled and uncontrolled association, three tests calling for constructive imagination, two tests primarily of reasoning capacity, six forms of cancellation test calling for concentration of attention and prompt and accurate perceptual discrimination, two tests of ability to follow instructions (written), one test of mechanical constructive ability, four tests of the puzzle form-board type and one test of ability in a routine process such as that of factory work.

Where practicable, the test was either repeated or given in

slightly different form, in order that its reliability might be computed. The reliability of any given test as a measure of ability in a given type of process was also tested by determining the correlations between the various tests of one given type. Correlations were also found between specific tests of the various groups. To determine the value of a given test for diagnostic purposes, its correlation was found with one of the organized groups of tests as represented by the modifications of the Binet scale and by the Woolley series. Where standards for any test are available, reference has been made to these and a comparison made of the age norm for the given test with those for other tests, and with the mental age obtained by one of the Binet modifications.

The After History of Fifty Delinquent Girls, Adjudged Feeble-Minded on the Basis of a Binet Examination Given Five Years Ago. H. H. GODDARD, Training School, Vineland, N. J.

This is a follow-up study of the 50 girls who had been in a Massachusetts Reformatory but were out on probation. This is the group studied by the writer and Helen F. Hill, published in *The Training School Bulletin*, June, 1911. At that time as a result of the test it was concluded that 52 out of the 56 were feeble-minded. It must be remembered that this was a very select group. On the assumption that these girls were feeble-minded, and realizing the bad habits that they had already formed, it was not to be expected that any radical reformation would occur, rather that continued trouble would be met with. The later history of these girls shows this to have been true. The value of mental tests in these cases is shown by the fact that a very few of these girls were recognized at the time, by the persons who had been dealing with them, as feeble-minded. Consequently, this fundamental fact was consistently ignored in their treatment. By means of the test their true condition and responsibility was shown, and an adequate explanation furnished for their conduct with definite indications for their future treatment.

The Mental Status of One Thousand Delinquent Boys and Girls as Shown by a Critical Application of the Yerkes-Bridges Scale for Measuring Intelligence. B. T. BALDWIN, Swarthmore College and Johns Hopkins University.

A psychological analysis of the mental traits of juvenile delinquents and a constructive, critical evaluation of mental tests

furnish the purpose of this investigation. The scope includes a statistical and a graphic representation of the sixty tests on a thousand individuals, supplemented by the subjects' physical condition, hereditary orientation, social deviation and school progress.

The correlations obtained show (1) that the scale needs revising and supplementing, and (2) that social deviation of the nature of delinquency is correlated with and partially dependent on mental deficiency, since 40.5 per cent. of the white girls are retarded mentally 4 years or more, 47 per cent. of the colored girls, and 32 per cent. of the white boys.

Comparison of Delinquent and Normal Boys in Tests, Some Little and Some Much Influenced by Environment. T. L. KELLEY, University of Texas.

Twenty different measurements and tests were made of boys at the Texas State Juvenile Training School, enabling a comparison with normal boys in a large number of traits. The physical measurements include height, weight, head measurements, strength of grip, rapidity of tapping, and physiological age. An examination of the eyes, ears and nose was made, and three tests involving the higher mental processes were given. These were the Binet test, Kelley's Constructive Ability test, and an adaptation of Trabue's Completion test.

Surprising differences are found to be present in certain traits, while the absence of such differences in others is no less striking. The boys compare very favorably physically with normal boys, being appreciably ahead in body weight. In physiological age they are retarded; subnormal in all the sensory and motor tests, markedly so in strength of vision; with the greatest retardation in the mental tests proper and in school standing.

The retardation of the various age-groups is expressed both in terms of years and in percentile position. School standing shows the greatest backwardness. A readily suggested though perhaps hasty conclusion is that this is the cause for the other deficiencies, and that it is caused by truancy and lack of school facilities. This might be contended were it not for the fact that the retardation shown by the Constructive Ability test is the greatest of all in terms of years, and next to the greatest (the completion test) in percentile position. The constructive ability test is surely little affected by ordinary school training, and ground is given for believing that the cause of delinquency is rooted in a deeper stratum

of human nature than that dependent upon environmental accretion. The retardation by the percentile position shows that the completion test sets off the delinquent boy group more completely from the normal group than any other test used, possibly because it depends upon native reasoning capacity and upon school training in English. The weakness in native reasoning ability plus the amount of truancy combine to cause a low record in this test.

NOTES AND NEWS

THE following items have been taken from the press:

PROFESSOR J. R. ANGELL, of the University of Chicago, is giving a course of lectures on "The Makers of Modern Psychology," on the Spencer Foundation at Union College.

PROFESSOR C. E. SEASHORE, of the University of Iowa, has announced a four-weeks' course on the psychology of musical talent and musical education during the next summer.

THE following deaths have been announced in different journals: The Rev. Bro. Chrysostom, professor of philosophy and psychology at Manhattan College, on January 24, at the age of 54 years; Sir E. B. Tylor, professor emeritus of anthropology at the University of Oxford, on January 2, at the age of 84 years; A. Chauveau, the physiologist and sometime collaborator of the late Professor Marey, at Paris, aged 89 years; H. Schule, coeditor of *Allgemeine Zeitschrift für Psychiatrie*, aged 76 years; Professor Bruns, of Hannover, author of numerous contributions on neurology and especially known for his work on nervous disorders of children, aged 58 years.

THE
PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

SENSATION—GENERAL

By MADISON BENTLEY

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De Laguna (2) protests against the frequent confusion of analytic and genetic sensations. She maintains that the infant begins (at birth) with a few sensory differences and gradually, under functional demands, acquires more. Her arguments are three: (1) development is presumably from the homogeneous to the heterogeneous, (2) Dewey's "new theory" of perception makes functional differentiation of the brain depend upon the differentiation of motor discharges, and (3) infantile behavior furnishes no evidence for the discrimination of colors, tones, and the like. The first argument has obvious limitations. It might as well be used to prove that the infant begins with a viscus or two and gradually acquires others. The author herself speaks, in another connection, of "the deceptive truth" that "the simple precedes the complex." The second and third arguments rest upon the assumption that behavior (even the behavior of the infant) supplies a complete and detailed index to the composition of mind. The article itself (in the second part) reveals the weakness of this assumption, where the admission is made that "sensation has no direct relationship at all to behavior" (p. 617). This part repeats the old contention that introspective analysis of a perception is impossible. Perception is a functional unit which can be changed but not analyzed. Sensation, a simple kind of "awareness" of quality (*cf.* James), is unique in so far as it is independent of other, more complex, functional systems.¹ The kind of analyst attacked by the article

¹ See Wundt, W., *G. d. p. Psychol.*, 6th ed., 1908, I, 400 ff.

may not find it easy to come to terms with a doctrine which rests upon the dogma—often beautifully illustrated but never substantiated by the facts—that perception depends upon organic movement; which ignores two or three competent accounts of introspection; and which uses the term “stimulus” almost as irresponsibly and variously as Dewey himself. The application to sensation of Professor Washburn’s notion of attention as “suspended reaction” suggests a fruitful tempering of the behaviorist’s doctrine.

The perennial problem of the relation of sensation to “sense data” and to physical objects is discussed by Broad (1) in his article on phenomenalism. The article is a criticism of B. Russell’s position on knowledge of the external world. It has much more to say of the “sensory data of knowledge” than of the sensations of analytical psychology. Articles by Nunn (4), and Moore and Stout (3) are of the same sort. Robinson (5) traces the history of the doctrine of sensation and perception from Condillac to Maine de Biran, who gives it a voluntaristic turn by basing the perceptual functions upon effort and will. Spiller (6) finds no present evidence that the different forms of sensations are separately represented in the internal capsule, though he thinks that they probably are separated in the parietal lobe, each sensory area lying adjacent to a corresponding motor area.

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VISION—GENERAL PHENOMENA

By EDWIN B. HOLT

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During the past year the most important work on this subject has been done not in Germany nor in Europe, but in America, and not in the colleges or universities, but in those now rather numerous

laboratories which have been established, and which are maintained, by companies that are engaged in illuminating, photographic, and other similar industries. The introspective and "purely psychological" points of view figure on the whole less prominently, and in their stead we find a more competent physical and mathematical handling of the problems than has hitherto been the rule.

One of the most comprehensive papers of the year is that of Troland on "apparent brightness" (33). He defines *light* as "radiation 'evaluated according to its capacity to produce' apparent brightness"; for, "strictly speaking, light is not the stimulus to vision, but is vision itself." The author introduces a semi-physiological light unit, the *photon*, which "is that intensity of illumination upon the retina of the eye which accompanies the direct fixation, with adequate accommodation, of a stimulus of small area, the photometric brightness of which, as determined by the standard flicker comparison and a normal subject, is one candle per square meter, when the area of the externally effective pupil, considered as lying in the nodal plane of the eye, is one square millimeter. The intensity of a visual stimulus, expressed in photons may be called its *physiological intensity*." Such a definition raises the question as to what is a normal or average eye. The answer to this question will doubtless have to come from organic chemistry: meanwhile several practical rules for discovering the observers who have "an average eye" are given by Crittenden and Richtmyer (8), who emphasize "the fact that for accurate heterochromatic measurements a systematic choice of observers is essential."

Troland further points out six stages in the (optical and) physiological process which intervenes between the impact of radiation on the outer surface of the eye and "the generation of the consciousness of light. . . . With regard to the intra-ocular adventures of this radiation we know a little; concerning retinal response, very little; and concerning the visual brain process practically nothing." As to the first, indeed, there are nearly thirty factors which must be known in order to deduce the quantitative constitution of the retinal image, and the majority of these "have not been measured even roughly." Yet it is the retinal image which is the actual physiological stimulus. There is room for exact investigations.

The author believes that retinal stimulation is "photochemical, depends on molecular or atomic resonance, and probably involves changes in the degree of ionization of substances contained in the receptors." There are two independent retinal processes, thoese

of the rods and of the cones, respectively. "The selective response of the eye to radiation of different wave-lengths (visibility curve) depends principally upon the photochemical selectivity of the retina." Both rods and cones may be electrolytic concentration cells. "Adaptation, or the general change in sensitivity to radiation of all wave-lengths, is conditioned by a change in the *concentration* of the light-sensitive substances in the retina." The retinal selectivity, or relative brightness of any radiation, probably depends on two factors—rod sensitivity and cone sensitivity. The former was measured some time ago by von Kries and others, while the latter has recently been measured by Ives and again by Nutting. The "visibility curve" of Nutting and Ives represents the relative sensitiveness of the cones to luminous radiations of different wave-lengths but of equal energy. It has one maximum, which is in the green, and it sinks rather rapidly towards the red and the violet ends of the spectrum. The curve is almost symmetrical, and Troland finds that when it is corrected for the *selective transmission* of the ocular media, macula lutea, etc., it is almost perfectly symmetrical, and approximates closely to the simple probability function.

Both Troland and Houstoun (16) have used this curve as the basis for some general remarks on color-vision. The former argues, as in substance also the latter, that "this striking symmetry of the cone visibility curve leads almost inevitably to the inference that *luminosity is due to a single photochemical process in the retina* [i. e., in the cones], and is not to be attributed to a summation of the response intensities of three or more color processes. . . . A more reasonable view lies in the original assumptions of Hering's theory, which identified luminosity with whiteness, and postulated a single, independent process for white, having a maximum in the middle of the spectrum." This view is further borne out by the fact that the following phenomena seem to be governed by intensity alone and not at all by wave-length:—the time required to produce a just-noticeable negative after-image, the time required for a stimulus to produce its maximum apparent brightness, critical flicker frequency, visual acuity, luminosity contrast and the summation of brightnesses (Ives).

Starting from the same visibility curve Houstoun (16) advances a "theory of color vision" which "does not depend on primary color sensations." "The most obvious explanation [of the curve] is to suppose that there exists in the eye a very great number of

vibrators, with a free period in the green, and that these execute forced vibrations under the influence of the light wave. The amplitude of the forced vibrations is a maximum when the free period of the vibrators coincides with the period of the incident light." These vibrators set up in the nerves waves which are transmitted to the brain. Trichromatism receives the following explanation: "The color-perceiving center [in the brain] is so badly developed that, so far as it is concerned, the curve [of the wave-lengths which reach the brain] is sufficiently specified by three points on it, provided that these points are distributed over the spectrum." The author does not "think it necessary to assume two different mechanisms," *i. e.*, rods and cones. "One system of vibrators will suffice." The word "assume" used in this connection illustrates how even to-day the physicist is apt to be ignorant of physiology, the psychologist of physics, and so forth. Von Kries (25) gives measurements of the relative amounts to which rods and cones participate in vision at various light-intensities: this is practically a correlation of the rod and the cone visibility curves previously mentioned. Under illuminations of the field varying from .01 to 25 candle meters, the proportionate part played by the rods in the seeing of gray paper ranges from .8 or .9 down to about .2. The intensity of illumination at which rods and cones participate equally varies, with different observers, from 1 to 5 candle meters. The computation involves an ingenious piece of reasoning.

There are two other papers of general scope. Ladd-Franklin (26), in a discussion of Parsons' book on "Color Vision," touches on several points of systematic interest, particularly trichromatism *vs.* tetrachromatism, and the relations between the Helmholtz, Hering, and Ladd-Franklin theories. And Goldschmidt (15), in a paper on "*Eigenlicht*," undertakes to summarize the various theories that have been advanced in explanation of the whole range of "subjective visual phenomena," and this interpreted so liberally as to include saturation, brightness, contrast, etc. These theories refer the phenomena to one or more of the seven possible sources named, which range from the dioptric apparatus to the Wundtian laws of apperception. The presentation is somewhat diffuse and academic.

Langfeld (27), in a paper which is perhaps on the border line between vision and thought-process, describes some experiments on imagery in which the subject was required to suppress some very

strong associations as for instance certain numbers in a consecutive running through of parts of the number series. The appearance and disappearance of imagery is significant. Imagery frequently "means" inhibition, and frequently it appears as a cue and the inhibitory process follows. Even very inadequate imagery can initiate and successfully guide motor response. After some practice of the *Aufgabe* imagery tended to disappear, but "when there was difficulty the image tended to appear again." Such observations, it seems to the reviewer, should be utilized in tracing the connection between immediate vision and the "higher processes."

From the introspective point of view Titchener and James Ward have argued as to the sensory character of black. In 1905 Ward expressed the opinion that black is not a "sensation"; that it is comparable to auditory silence. Titchener (31) finds that Ward does not distinguish nicely between the strictly introspective findings on "black," and such extraneous considerations as the conditions of eye stimulation and theories of vision. In his reply (41), Ward insists that black is not a "positive sensation; though a 'body-color,' *i. e.*, a secondary quality in the epistemological sense, we must allow it to be." Titchener (32) publishes a rejoinder. The arguments are somewhat finely-spun, by both sides. It all comes down, doubtless, to the question as to whether one *sees* black as a sensory quality, and here probably the great majority of persons would agree with Titchener. Alspach (2) studies, by three methods, the question of "simplicity *vs.* complexity of color hues," and concludes that "however 'like' a hue may be to neighboring hues, it apparently cannot be resolved by purely psychological methods into these hues as components." It would be a mistake to accept this conclusion without an examination of the tables presented. There were many judgments of "complex" and many of "unitary," and it does not appear to the reviewer why either type of judgment should be arbitrarily minimized.

Among other qualitative papers is one of unusual interest by Swindle (30), on positive after-images of long duration. "In successive and simultaneous color induction, any color induces first itself and last of all its antagonistic color." A second positive may succeed the latter, and the duration of one or more of these phases can be remarkably prolonged by inhibiting all muscular activity, and by very brief and carefully timed renewals of the stimulation. In this way the author has obtained positive after-images of hallucinatory intensity and several minutes' duration.

In one case a positive after-image was renewed in great distinctness after forty minutes spent in a well-illuminated room. This observation is somewhat like those of G. H. Miles (1915). Swindle suggests that such after-images are utilized by spiritualistic mediums. He further describes some experiments in which an owl and a cockatoo were observed trying to adjust themselves with reference to an after-image, *e. g.*, they tried to hop on to an after-image of the perch. It was evident that the after-image appeared to move with movements of the bird's head and body. These observations are in method novel, and admirably illustrate the behavioristic point of view.

Cook and Kunkel (7) report that the simultaneous and successive contrast color for red is bluer than the true complementary (color-mixture); and for yellow and blue is redder than the complementary. The "anomaly" is enhanced when brightness contrast is eliminated. Almack and Arps (1) have studied the effect of a preceding colored stimulation on the recognition limen for color. In general, if the after-effect of the preceding stimulation is similar to the second stimulus, the limen for the latter is thereby lowered. But an inducing stimulus of any color will to some extent lower the color limen for a succeeding stimulus, and this even when the after-effect of the former is of a color complementary to the latter. Troland (40) describes an interesting "reversal" effect. One half of a circular field is exposed for 30 seconds, and then the second half is exposed as well. The longer-exposed half of course appears the less bright. If 3 seconds later the intensity of the whole field is reduced to one tenth, and then after 45 seconds more is restored to its original intensity, the longer-exposed half will appear *brighter* than the half that has been less exposed. This seems to reverse the law of fatigue. The effect can be obtained under a considerable variety of conditions, and "is present most strongly in the long-wave end of the spectrum, and with decrease in the wave-length higher and higher intensities are required to bring it out." The same author (37) has repeated, with several additional and obviously necessary precautions, the experiment with which Hering (1915) claimed to have demonstrated the Purkinje phenomenon to be fleetingly obtainable in foveal vision. With the additional precautions it was found "impossible to detect the slightest trace of a Purkinje effect when [foveal] fixation was accurately maintained." Weiss (42) describes an interesting mat woven from strips of colored papers, which is designed for demon-

strating the Purkinje phenomenon. A small white spot is fixed in the centre; and in twilight vision this is not visible foveally, while the adjacent colored squares are less distinct than those that are seen peripherally. "The foveal area tends to be filled in by imagery of the surrounding surfaces" (like the blind-spot). At that intensity of illumination for which the colors of the squares become just visible, the mat appears "to be made of mosaics which seem to be at different distances" from the observer.

Of the more exactly quantitative papers, several deal with the flicker-photometer. Ives and Kingsbury (17) add a second instalment to their (1914) theory of the flicker-photometer, and in this discuss "unsymmetrical conditions," *i. e.*, unequal periods of light and dark stimulation. This theory (for which see the earlier paper) is important, and while the authors do not claim that it is as yet entirely satisfactory quantitatively, yet "it does handle the principal phenomena qualitatively in a very striking manner." The flicker-photometer may be used in two ways. In one of these the color to be measured is alternated with black, and the speed adjusted until flicker just disappears. The speed so found is a measure of the intensity of the color. This method is "very insensitive." According to the other way, which is "very sensitive," the color to be measured is alternated with a variable and measurable white. The latter is adjusted to approximate equality with the former, and the speed then found which will just not give complete fusion; this speed is now kept. The white light is now again and more carefully adjusted, until the minimum of flicker is obtained. The intensity of the white is now equal to, and a measure of, the intensity of the colored light. "The high sensibility of the flicker photometer is shown to be due to the very rapid increase in the critical frequency of disappearance of flicker on each side of the equality setting." When the compared lights are exposed "for unequal periods, the less exposed color will be under-rated. This form of flicker photometer is less sensitive than the ordinary equal exposure arrangement."

Troland (35) says: "The flicker-photometer frequency of any two visual stimuli may be defined as the rate of alternation (cycles per second, with equal intervals) of the two in the same photometric field, which is just sufficiently rapid to eliminate flicker, when the ratio of their intensities is such as to give a minimum of flicker at a slightly lower rate." Both Troland (33, 35) and Ives (22) find this critical frequency to increase with the hue difference between

the lights compared. Troland finds that the flicker frequency curve for a white standard compared with various spectral colors shows one minimum, at about $575\mu\mu$, and maxima towards each end of the spectrum. "A considerable alteration of the color tone of the standard changes the position of the minimum only slightly, so that it seems very probable that the curve depends upon the *inherent saturation* of the spectral colors at equal luminosity. . . . The addition of a white light to a saturated spectral color decreases its flicker photometer frequency very slowly." Ives (22), from in part similar measurements, is led to a different conclusion. He finds the critical frequency to be intrinsically a direct function of the "number of hue steps" between the compared lights. "If the comparison lamp is red, the minimum speed is in the red, if blue, in the blue, if yellow-white, in the yellow, but with a much higher speed at the blue than at the red end, while for a true white (5000° black body) the curve is symmetrical about a minimum in the green." And Troland (38) finds that in heterochromatic comparisons of brightness which are not based on apparent equality, but on just-noticeable inequality of brightness between the two colors, "the brightness discrimination threshold is a minimum for a minimum of color difference between the two compared stimuli," and "on the average it has a value four or five times its minimum, for a maximum of color difference."

Troland (39) further reports the critical frequency to be a direct function of the intensity of the compared lights. "If the logarithms of the frequencies for any one color are plotted against the logarithms of the intensities, the resulting curve is approximately a straight line for intensities between 40 and 1560 photons." In the Ives-Kingsbury theory of the flicker-photometer Ives (21) points out that "there figure two fractions, the brightness discrimination fraction, and the hue discrimination fraction. . . . The ratio of hue fraction to brightness fraction is about ten times larger for intermittent than for steady vision. *Herein lies the reason for the success of the flicker photometer.*" Crittenden and Richtmyer (8) deem the flicker-photometer distinctly more reliable than the equality-of-brightness photometers, whether the color differences between the lights to be measured are great or small. In (19) and (17) Ives discusses another factor, "diffusivity," which figures importantly in the Ives-Kingsbury theory. This seems to be so far an element in the theoretical equation, rather than an actually identified physiological process. For a given speed of the flicker-

photometer, an abrupt transition between the two illuminations enhances the sensitivity. But with such a transition mechanical imperfections in the apparatus can introduce serious errors. For some purposes a gradual transition is preferable. Ives (20) describes a flicker-photometer in which by means of polarizing prisms the sharp dividing edge is eliminated: one phase disappears as the other simultaneously appears, both decrease and increase exactly following the sine function.

Ferree and Rand (9) describe a method of heterochromatic photometry in which the stimulus to be measured is viewed peripherally (25 degrees) while the other field is fixated directly. Johnson (23) points out several objections to the method as described, which seem to the reviewer to be well-founded.

Troland (33, p. 952) proposes the term *minuthesis* for the "depression of a sensation under the influence of a stimulus, to replace the misleading word, 'fatigue.'" In (34) he gives measurements of the time required to produce a just discernible minuthesis for different colors at the same intensity. He also gives measurements (34, 36) of the time required for the retina to reach a condition just indistinguishable from that of equilibrium. For, "given a sufficiently long exposure, the visual system reaches a *state of equilibrium* with respect to any stimulus which may be acting upon it." In this state the eye yields a sensation which is not subject to further minuthesis.

Cobb (4) reports on the effect on vision of brightness of surroundings. He finds that brightness discrimination, and to a less extent visual acuity, are reduced when the surroundings have a considerably higher brightness than that of the test-field. Bright surroundings, *if not brighter* than the object to be looked at, are probably better for the seeing of detail than are dark surroundings. Brightness discrimination is best when the surrounding field and the test-field are of the same brightness. Cobb (5) also describes an improved apparatus for the study of this and similar problems. Nutting (28, of which 29 is an abstract) gives compact data on: (1) threshold brightness for different degrees of brightness adaptation; (2) "the brightness that would just appear uncomfortably bright [glare] with the retina adapted to any given brightness"; (3) the limen of brightness difference for different degrees of brightness adaptation (*cf.* Cobb, 4). A new term, "discrimination factor," "is defined as the field brightness [general brightness adaptation] divided by the just noticeable difference, B/dB . This

quantity is a direct measure of the power to distinguish details except when large color differences are present. Visual acuity so called, a mere sharpness of definition, is a minor factor when contrasts are slight." A brief but comprehensive table of measurements of this factor (for field brightnesses varying from 0.0000001 to 10,000.0 millilamberts) is given.

Ferree and Rand (12) add a fifth contribution to their series dealing with conditions of lighting. A considerable number of tables is given, which deal mainly with the properties of pendent reflectors, and will be of interest chiefly to those who are studying the question of illumination. The authors have summarized their general results in (13) and (14) where, however, little is added to the substance of papers which were reviewed in the *BULLETIN* in 1916. The authors find that it is highly desirable to have the field of vision uniformly illuminated (*cf.* Cobb, 4, and Nutting, 28), the light well diffused, and no extremes of surface brightness. Caldwell (3) finds "for a given observer and a given value of illumination a rather definite preferred relation between direct and indirect illumination." This preference is for rather "more indirect than direct illumination." This is in general agreement with findings of Ferree and Rand. Also "a notable capacity for retaining a concept of an illumination value and of reconstructing it after an interval of time, is demonstrated."

Of papers dealing more especially with methods and apparatus, one of the most generally valuable is by Cobb (6). The paper is written for "investigators in those branches of biological science which deal with light-effects," and describes clearly some of the fundamental physical conceptions which must be understood by any one who wishes to manipulate light-stimuli intelligently. Some of the heads treated are: Point and extended sources, regular diffuse and mixed reflection, the three analogous types of transmission, reflectors and transmitters as secondary light-sources, images as visual objects, the measurement of brightness, and the relation of light to energy.

Ferree and Rand (10) describe an ingenious form of campimeter in which the stimulus is spectral light of known wave-length and intensity, and can be presented at any point (up to about 90 degrees of eccentricity) of any meridian of the retina. The same authors (11) suggest, as a substitute for the artificial pupil, focusing the stimulus light upon the pupil of the eye, there "forming an image of the analyzing slit of the spectroscop." The essential features

of this method have been previously described by Cobb (*Amer. J. of Physiol.*, 1911, 29). Ives (18) describes an improved form of his visual acuity testing device (first described in 1910). The two single-line gratings of the earlier form are now replaced by cross-line gratings, which when rotated with respect to each other present a pattern of uniformly distributed squares which expand or contract as the gratings are turned. Kirschmann (24) recommends gelatine light-filters for the production of "monochromatic" light. The main advantage is that large areas can be illuminated. No special formulae for monochromatic gelatine dyes (the crux of the whole matter) are mentioned. Woodworth (43) gives an equation for calculating the conjugate foci of spherical lenses. The equation that is now commonly given in text-books is approximately accurate only for very thin lenses.

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CUTANEOUS AND KINÆSTHETIC SENSES

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Although the war has greatly reduced the number of articles on cutaneous and kinæsthetic senses, still the literature of the past year in some ways makes up in intensive interest what it lacks in extensivity. Most important is the continued interest in the line of work started by Head and his collaborators. The study of the cutaneous sensibility of skin areas supplied by regenerating nerves was continued by Trotter and Davies, and with somewhat different technique by Hacker whose results were reported last year.¹ During the past year Boring (2) has published the results of his experiment on nerve-division. He has added to the results a critical review of Head's theory and a theoretical proposal of his own. Moreover, Carr (3) has made a painstaking examination of Head's results in connection with a critique of the Head theory. Boring's work was undertaken under rigidly controlled psychological conditions, the author himself acting as subject. The investigation therefore had the advantage of having a trained psychologist as observer. Quantitative methods were employed to test the sensitivity of the affected area. There was also a preliminary period of practice. This covered fifteen months before the operation during which time the subject devoted from three to eight hours a week to practice in discrimination of different cutaneous sense qualities, localization, and discrimination of two points. The nerve chosen for section was the anterior branch of the internal cutaneous of the left arm. As a result of the operation a small area of skin on the left forearm became anæsthetic. This area was located near the wrist on the volar surface and slightly to the

¹ See this BULLETIN, 1916, 13, 138.

ulnar side. This area consisted of two zones, a central one of cutaneous anæsthesia, and surrounding this a zone in which hypoæsthesia prevailed, this condition increasing in degree from the outer edge to the inner boundary. The regions of sensory loss were approximately the same for the different forms of sensibility, although their distribution over the skin was always irregular and patchy. The outer parts of the affected area regained their sensibility first, and there was no evidence that recovery followed the course of the nerve. Deep sensibility to pressure and pain was not changed at any time during the course of the experiment. The four cutaneous sense qualities tended to return from anæsthesia or hypoæsthesia through diminishing degrees of hypoæsthesia to normal. Warmth and cold, however, passed through an intermediate stage of hyperæsthesia. Pain, pressure, and cold all returned to normal at about the same rate; warmth returned much more slowly. In the course of recovery warmth and cold sensations were often remotely referred. Sometimes a sensation was felt as "double," remote reference and immediate reference occurring together. In the experiments on localization and two-point discrimination pressures of 20 gm. were used, and it was found that these functions were unaffected. No new qualities of sensation were experienced at any time. Many unique experiences were found to be merely unusual combinations of familiar qualities. The author's objections to the Head theory are that it is not borne out by analogy in the other sense spheres, that it fails to account for many established facts of cutaneous sensibility, that it does not even explain the facts it attempts to summarize, and finally that it indicates a number of doubtful generalities. The author proposes another theory which he summarizes as "one which assumes that single sensory spots are innervated by more than one nerve fibre, that the multiple innervation is projected upon the central nervous system as multiple excitations which depend for their degree upon their relative strengths, their separations in the region of projection, and a limitation of the available amount of central energy. Under these conditions, multiple innervation may be effective as summation or as inhibition of the excitations involved. The division of inhibiting fibers may result in hyperæsthesia or in abnormal localization; the gradual appearance of these forms of abnormality is due to the gradual effect of practice in the assumption of vicarious function." For the consideration of the results in the light of this theory as well as for an appreciation

of the many niceties of method and the numerous particular results, reference must be made to the original article.

Carr (3), in criticizing Head's theory, calls attention to the fact that it requires, as Head rightly admits, that: (1) The various qualities must fall into two independently variable groups; either group may be present while the other is absent, and (2) within the group all functions must invariably occur together; no internal dissociation is possible. The author's first criticism is one of fact. A careful analysis of Head's data seems to him to show that neither of the two requirements is met. The author tabulates this data and he thinks that if a number of persons without knowledge of Head's theory should be confronted with the table they would conclude in favor of six or seven variables instead of Head's two. The second criticism has to do with Head's assumption that the time of recovery for the "protopathic" system is a constant irrespective of the location of the nerve-section. The figures, however, indicate that recovery proceeds from the end of the affected area near the point of section to the further end, and this order holds for both systems. The third criticism is concerned with the application of the theory to explain the peculiar sensitivity of certain areas. A consideration of the forms of cutaneous sensibility which exist in these areas seems to indicate that the qualities of either of Head's two systems may be dissociated and exist apart from each other. The author raises the question of whether Head's seven qualities can be reduced to the conventional four, and he believes that they can by regarding the "protopathic" qualities as a natural result of an early stage of recovery, at which time the stimulus threshold would naturally be high.

Ranson and Billingsley (9) in a physiological study of the conduction of painful afferent impulses, bring their results into relation with Head's theory. Experimenting upon cats, they find that the afferent impulses which give rise to pain reactions are conducted over the lateral division of the dorsal roots. The fibers in this division, in contrast to those in the medial division of the dorsal root, are unmyelinated. These fibers, the authors think, present great similarities to what is known of Head's "protopathic" fibers, and, mediating as they do the quality of pain, they think it likely that they mediate the other "protopathic" qualities of cold and warmth as well.

Dimmick (5) reports a study of cutaneous after-images. Previous investigators had found a difficulty in such work in that there

seemed to be two after-sensations, each one regarded as coming from a separate source. In this investigation therefore care was taken to use stimuli known to be above the limen for sub-cutaneous pressure. After the removal of the stimulus the sensation was followed by an after-sensation, this was followed by a latent interval, and this in turn by an after-image. The duration of these three processes is measured for each of the two subjects who took part in the experiment. Although the absolute duration is a number of times longer for one subject than for the other, the relative times for the three intervals are approximately the same for both. The after-sensation is about twice as long as the latent interval, and the after-image about four times as long as the after-sensation.

Amantea (1), writing from the war zone, describes an æsthesiometer constructed from materials available in a field hospital. He has found it serviceable in the field, but it is doubtful if it represents a valuable contribution to laboratory apparatus.

As far as the reviewer knows, no experimental investigation of kinæsthetic sensations as such has appeared during the past year. Several articles have appeared, however, which should be of interest in this connection. In connection with a discussion of the importance of movement to the organism Dearborn (4) lays emphasis upon the rôle of kinæsthesia in consciousness. Kinæsthesia plays a large part in "cenesthesia" which is "the ground-work of the mind, conscious and sub-conscious." Physiological studies of the effects of labyrinth extirpation in the cat are reported by Prince (8), and by Muller and Weed (7) and Fisher and Muller (6). One of the immediate results of unilateral extirpation of the labyrinth is torsion of the head to the injured side. Finding that in the cat this posture is associated with diminished tonus in the cervical musculature on the side of the lesion, Prince tried various combined lesions of labyrinth and dorsal roots of the cervical nerves to see how the torsion would be affected. The results of different combinations seem to indicate that the torsion after unilateral removal of the labyrinth is due to the preponderating activity of the muscles on the intact side. The other study of labyrinth extirpation was undertaken first to investigate the falling reflex of the cat. Experiments with normal cats showed that when held upside down and dropped they could accomplish the 180 degrees turn necessary to light on their feet in a fall of a foot, and some were able to do it in six inches. When one labyrinth was extirpated the cats could still accomplish the turn in the air, but they always turned away

from the affected side even when held so that they would have to turn through 270 degrees to do it. The study of cats with unilaterally extirpated labyrinths was continued by extending the observation over a considerable period of time. When blind-folded and dropped these cats turned, always away from the operated side, but they did not necessarily land on their feet as they kept on turning until they struck the bed of straw upon which they were dropped. One, when dropped from a considerable height, was observed to make two complete turns in the air. This turning on the part of the blind-folded unilateral cats could not be accomplished until twenty-four hours had elapsed after the operation. Some of the unilateral cats were placed in water. They started to swim, but immediately the side toward the lesion went down, submerging their heads and depriving them of the use of their eyes, and then they began to revolve continuously and rapidly about their long axis in the direction away from the lesion. The nystagmus which immediately followed unilateral extirpation disappeared about thirty hours after the operation. In the course of a few days the tendency to walk in a circle was lost, and there was a gradual though incomplete recovery of the normal postural and muscular reactions of the animal. After two months two of the cats were able to swim as long as they kept their heads above water, though the instant their heads went under they began to revolve.

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ORGANIC SENSATION

By EDWIN G. BORING

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Boring (1) has found that stimulation of the esophagus may give rise to qualities of warmth, cold, heat, and thermal pain, which are identical psychologically with the corresponding qualities from the skin; that cutaneous pressure and pain can not be elicited from the esophagus, but that distension brings out successively the qualities of muscular pressure and muscular pain. The esophageal sensations are referred away from the middle portion of the esophagus in the direction of one end or the other.

Carlson has brought together in a book the numerous researches by himself and his collaborators on the physiology of the stomach. This book, *The Control of Hunger in Health and Disease* (4), summarizes the work in its field and includes a useful, if inaccurate, bibliography of 283 titles. Carlson demonstrates conclusively that the gastric mucosa is insensitive to tactual and painful stimuli of all sorts. He had an exceptional opportunity for experimentation upon his subject with the gastric fistula, since he could get at the mucosa directly. The sense of fulness, which comes with distension of the stomach, and the pain found by Boring and others with great distension must come from the muscular coats.

Carlson also finds the gastric mucosa to be endowed with "protopathic temperature sensibility," since hot and cold water and ice are effective stimuli. Boring inclined in his first paper (1) to the belief that the stomach was thermally insensitive, because such extreme temperatures were needed to bring out the two thermal qualities. Later (3) Boring measured the temperature within the stomach by means of a thermo-electric couple and found that extreme stimuli, as determined before their mixture with the stomachic contents, are very much nearer body-temperature when they become effective in the stomach, and that such mild temperatures as 30° and 40° C. produce in the gastric mucosa the sensations of cold and warmth respectively. Obviously Carlson's use of Head's term "protopathic" is unfortunate in this case, for here we have, in a region which is theoretically protopathic, thermal sensations with epicritic thresholds, dissociated from the epicritic *sine qua non* of pressure and the protopathic *sine qua non* of pain. Both Carlson and Boring agree that the thermal sensations of the stomach and

of the esophagus are introspectively separable with respect both to pattern and to localization.

Carlson's work appears to establish finally the correlation of sensation of hunger with the hunger contractions of the stomach; hence the conditions of the hunger contractions gain psychological significance as the conditions of hunger. Thus hunger appears to diminish with advancing age, to be decreased by smoking and, in its initial stages, by tightening the belt, and to be inhibited by stimulation of the mouth (even chewing paraffin may be effective) and of the gastric mucosa, and by dreaming (6). Physical exercise, external cold, excessive hemorrhage, and, in spite of the current belief to the contrary, starvation, all increase hunger. Qualitatively—both Carlson and Boring (2) agree—hunger is a complex of muscular pain and kinesthetic pressure.

Boring (2) finds that thirst, nausea, defecation, urination, and the calls to defecation and urination are also complexes of pain and pressure, without qualitative novelty. Thirst is referred more to the mouth than to the throat. Nausea appears in many different patterns but always with a core of pain that is similar to or identical with the hunger pain. Carlson admits the presence of tension and pain in nausea, but urges that over and above these concomitants there is a "distinct 'sickness' character" in nausea, and that a confusion of hunger and nausea is not normal.

Carlson's most positive psychological contribution is to the problem of appetite. He holds that the gastric mucosa is endowed with a "protopathic appetite sense." Far from being allied to hunger, the appetite sensation contrasts with the hunger sensation and is best perceived if weak chemicals (beer, wine, 0.5 per cent. HCl, gastric juice, cold water) are introduced into the stomach through a stomach-tube during hunger. The tube eliminates the sight, taste, smell, and imagery of the food, and the consequent salivation and movements of deglutition. The stimulus inhibits the hunger contractions and brings out the experience of appetite which contrasts with the preceding hunger. Appetite is not due to the cessation of the hunger since it can be brought out alone. The indication of a unique quality is strong, but it must be remembered that Carlson does not mean by sensation a psychologically simple quality, for he also speaks of hunger, a complex of pressure and pain, as a "sensation."

Cannon's book, *Bodily Changes in Pain, Hunger, Fear and Rage* (5), bears on the problem of organic sensation. His thesis is that

in certain sthenic emotions mentioned in his title the bodily state is the same, viz., the widespread effects that come from the excitation of the sympathetic nervous system and the secretion of adrenalin; and that these emotions are therefore not to be distinguished by their organic constituents. Cannon's description of this widespread action of the sympathetic system suggests that there must be a corresponding consciousness which forms a fixed emotive organic pattern and which, it seems to the reviewer, may ordinarily escape analysis into constituent organic sensations because of its very complexity.

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SPECIAL REVIEWS

The Fundamentals of Psychology. W. B. PILLSBURY. New York: Macmillan, 1916. Pp. ix + 562.

Professor Pillsbury's new textbook "is intended to fill a gap which exists to-day between the smaller texts and the reference hand-books," as it is intended for students without previous training who are willing to give a year to the study of psychology. The first chapter treats of the general problems of psychology and with the general materials with which the science is interested. "It (psychology) deals with the activities commonly known as mental, the processes of perceiving, of remembering, of thinking, and particularly with the acts of the individual" (p. 1). Observation and introspection are the two general methods for attacking the problems of the science; but, of these, introspection is made a

supplementary method to the objective means of obtaining the facts.

Two chapters follow with a discussion of the structure and function of the nervous system. This structural discussion is largely from the histological viewpoint with a considerable section on the development of the nervous system. These chapters are plentifully illustrated with excellent cuts and diagrams. Next follow two chapters on sensation, one entire chapter being given to a discussion of vision, and the other to the sensations of all other modalities. The structure of the receiving end-organs, the facts of sensation and the principal theories are discussed. The attribute of quality is emphasized throughout and, indeed, quality and intensity are the only two admitted attributes of sensation, as all of the other alleged attributes are referred to perceptions.

There next appears a chapter on images, or, to use Pillsbury's terminology, "centrally aroused sensations." The laws of association and imaginal types are treated at this place. Attention and selection are discussed in the next chapter. The physiological accompaniments of attention and the conditions of attention are rather more strongly emphasized in this connection than are the psychological facts of the subject. Then follow two chapters on perception; the first on the perception of space; the second on the perception of visual movement, time and rhythm. The processes connected with reading and with the understanding of spoken language are discussed under the heading of the General Laws of Perception, and the importance of meaning is emphasized in this connection. Memory is next treated largely from the quantitative aspect. The discussion includes the factors of learning, such as the effect of repetitions and the like, and the rate of forgetting. The process of recognizing is placed under the general heading of remembering as is also that of productive imagination.

Next follows a largely speculative and logical chapter on reasoning. The term reasoning, as the author employs it, includes practically all of the so-called higher mental processes except recognition and will; namely, the incentives to reason, judgment, inference, belief, and proof. The importance of meaning is again discussed and emphasized at this point. The author's concept of instinct, which is next considered, is exceedingly broad and includes all sorts of reactions from a mere complex reflex, such as the chick pecking its way out of the shell, to the very complex reactions of man. Even "acquisitiveness, combativeness and sympathy"

are regarded as individual instincts. Racial and social instincts and the origin of instincts are also discussed.

A distinction is made in the next chapter between feeling and affection. The latter is considered to be a mental element and has only two qualities, pleasantness and unpleasantness. Feeling is conceived as a combination of this element and sensations. Emotion, which is next discussed, is conceived as a complex feeling plus the fact that it is accompanied by a purposive response. A modified formulation of the James-Lange theory of emotion seems to be accepted. After a discussion of the recent refined physiological work on the emotions, the author believes that the distinguishing marks between the different emotions are to be found in differences in facial expression and general bodily posture rather than in the finer and less obvious internal processes of secretion and the like. Professor Pillsbury (p. 480) turns from the shortcomings of the scientists to the novelists for confirmation of this view.

Volition is approached, in the next chapter, from the standpoint of the general principles of action. The trial and error methods of learning in man and animals are first discussed and the general form of the learning curves pointed out. The author stresses the incentives to movement and thus leads up to volition. The will process consists merely in a choice of incentives and, as soon as any particular incentive has been clearly attended to, it becomes a goal idea and the movement takes place. The control of movements and the factors leading to the choice of some particular motive for movement are discussed.

Professor Pillsbury, in the final chapter, treats of the self concept, again largely in a speculative and logical fashion. In the first place, he minimizes the importance of an awareness of self, this awareness becoming conscious only in times of struggle. The self consciousness is made up of a complex of three individual self concepts: (1) the bodily self, present largely in imagery of the body; (2) the subjective self, present in kinæsthetic and organic sensations; and (3) the effective or dynamic self, present in a "feeling of effort" which may be reduced structurally to sensations of strain.

The critic may question the pedagogical advisability of devoting nearly the first sixth of the space to a discussion of the anatomical and physiological basis for psychology, before the student has heard anything of or developed an interest in the science itself. This criticism would hold against the majority of the elementary textbooks, but Professor Pillsbury justifies his use of so much space

in the text by applying a physiological explanation to all of his processes; meaning, the self, dissociation, habit and association are all explained in physiological terms. We rather question the factual basis of some of these physiological explanations, however. Changes of resistance at the synapse are emphasized in many places. "All learning, whether in the formation of habits or in the connection of sensory impressions in sensory learning, is due to this reduced resistance." Meaning is explained in terms of "partially opened association paths" (p. 394). These are matters upon which the physiologists themselves are not agreed, as some very notable physiologists would still deny the significance of the synapse. It seems to us a rather mischievous proceeding to supply gaps in the body of psychological fact by explanations in terms of physiological theory which is not universally accepted.

We are particularly struck, however, by many inadequacies in the text. The kinæsthetic sensations are dismissed with a discussion of little more than two pages, although the author has defined psychology in terms of a modified behaviorism. Again, the question of imaginal types is given a discussion of three pages in one chapter and the importance of the different types to memory is given one page. We would also class among inadequacies of the text certain cases which we believe are cases of exceedingly false emphasis. For example, ten pages are given to the development of the nervous system while a total of only five pages is given to a discussion of complementary colors, color blindness, peripheral vision, negative after-images and visual contrast.

At the end of each chapter the author cites a list of references to general discussions of the subject matter covered; there seems to be, however, an inadequacy of exact references throughout the book. The date of publication is not added to any reference, which we believe is an unfortunate omission. At times certain references are given in footnotes to some particular experimental study. These are very few in number and at times unfortunately chosen, if any such references are to be given at all. For example, the only exact reference to any particular study in the entire chapter on vision—other than giving the names of authors in the text—is to an experiment by a Miss Bills. It turns out that her results were included in a footnote in an article by Ferree and Rand and this reference to a footnote is the only exact reference given in the entire discussion of visual sensations. We believe that the student who is to give a year to his study of psychology will desire more

frequent exact references to the literature than these, if he develops any interest at all in the science.

Professor Pillsbury mentions in his introduction that he will have little to say about methods, and he consistently adheres to this throughout the text. Such an attitude may be admissible in a superficial course in psychology but, we believe, that if the student is willing to give a year to the work he should obtain more than a mere accumulation of psychological facts. Besides these, he should obtain some concept of how these facts have been obtained so that he may approach his reading in a critical manner.

SAMUEL W. FERNBERGER.

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Manual of Mental and Physical Tests. G. M. WHIPPLE. Baltimore: Warwick and York, 1915. Pp. v + 336. \$2.00.

In the five years which elapsed between the first and the second edition of this work it firmly established itself as a manual of directions and as a compendium of the published results of 54 representative mental and physical tests. It serves as the standard reference book to which one who is to make tests naturally turns to consult before determining upon his method, and to get a starting point for a study of the literature.

The new edition, as was pointed out in the review in this journal of the first volume, is a thorough revision of the first edition, but is not at all altered in character. In this second volume, which deals with the complex mental processes, two new tests have been added—the Kent-Rosanoff test and the analogies test—and the Binet scale and other test series have been reserved for separate treatment. The immense amount of literature which has appeared on serial tests in recent years, and the peculiar principles which are involved in them, makes this procedure wise.

A notion of the amount of additional material which has been added in this volume may be gained from a few statistics. The number of pages has been increased from 185 (excluding the serial tests) to 315. All but 23 pages, which are occupied by the two new tests, represents new experimental work, most of which has been carried on since 1910. The number of references which are given for the same tests is more than doubled, increasing from 190 to 390.

The inclusion of this large amount of new material has necessitated complete revision. In some cases the directions or inter-

pretation of results have been modified independently of the requirements of the new material, but frequently recent work has caused elaboration of method, and still more frequently, the enlargement of the treatment of results.

Critical comment is hardly necessary. The work is carefully done and of very material service.

FRANK N. FREEMAN

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Experimental Psychology. (A Loose Leaf Manual.) A. T. POFFENBERGER, JR. New York: Morningside Press, 1916.

A thoroughly up-to-date method of presenting experiments to be performed by a beginning laboratory class, is the Loose Leaf Method. Forty-eight experiments, each on a separate sheet, are available for immediate inclusion in the student's note book without the necessity of copying. At the direction of the instructor, certain experiments can be omitted or the order changed. Each experiment is headed with references to literature, among which, papers in the *Archives of Psychology* appear frequently. Credit is given also to Whipple's *Manual*, Titchener, Seashore, Sanford, Myers and Thorndike. There follow a statement of the problem, description of materials required and directions for the conduct of the experiment and tabulation of results. Under conclusions appear questions to be answered by the student, with suggestions for varying the procedure.

Among the experiments, novel to such a manual, is one entitled "Memory for Names and Faces." Photographs furnish the faces, the name to be associated is spoken by the experimenter at the time of showing. After 20 have been shown, they are again presented and the observer is directed to recall the name. The student's attention is called to memory, attention and emotions for an explanation of his failures. In a later experiment, photographs are to be classified according to the predominance of "intelligence, kindness, generosity, humor, neatness and honesty." Another series of photographs shows one person exhibiting 24 different facial expressions. In this experiment the task is to identify the emotion depicted.

No experiments leading to theories of color vision, audition, tactual sensations, etc., appear in the list. Instead, the first half of the list of experiments deals with learning, memory, association, imagery, and reaction time. The principles of action and function

are emphasized throughout. Practice effects, interference and inhibition, transfer, forgetting, recall and recognition lead on to the main conditions of memorizing, such as number and time of repetitions, material, position in the series, mass and sectional methods, and incidental memory. These topics are followed by a study of free and controlled associations, and the structure and function of imagery. The latter half of the list deals with spacial and temporal phenomena, the spectroscope and pseudoscope, size, direction, distance, localization, with discriminations and judgments, and closes with two experiments on fatigue.

The experimental directions are clearly written, and the choice of experiments leads to the problems of more general interest in psychology, eliminating many of those which are perhaps better suited for training in analytical research.

A. H. SUTHERLAND

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The Intelligence of the Feeble-minded. BINET & SIMON. (Trans. by E. S. Kite.) Vineland, N. J.: The Training School, 1916. Pp. 321.

Among the lesser of the things they manage better in France is the expression of scientific observations in simple words; and a special service has been done in preserving that virtue to us in this compiling of translations from Binet. While it retains the French "accent," it has also kept the charm of the original's style. A translator who dares not depart far from the text seems to fare better with French than with German, which is clumsy in over-literal rendering, while the slight impress of Gallic affectation is far from unpleasing.

A move in French naval tactics has been described "to give the appearance of a weakness which does not exist." One wonders how often French scholarship makes a similar showing without the strategic sanction—as in this book. It would get short shrift from a critic trained to a statistical attitude towards mental phenomena. The book itself has little evidence that the authors' observations extended beyond the handful of cases of whom they tell us in a chatty, anecdotal way. But as Goddard brings out in his introduction, the subsequent confirming of the essential theses should convince us that when it is said that Denise or Cabussel do so and so, it is because Denise and Cabussel are also the symbols of large experience and brilliant intuition.

The measurement of intelligence has developed much since the appearance of these writings, and the well-posted reader must not expect many new suggestions on these points. It is rather as a keen analyst of mental processes that these chapters will preserve their leading author's name. His formulation of the attention problem, his discussion of the cooperative effort demanded by different tests, his division of the mental processes of speech, will repay the attention of others than those interested in defect conditions. In regard to false judgment (*esprit faux*) his interpretations run curiously parallel to those based by Janet upon a different material. Behaviorism may derive sanctions more agreeable than necessary from some lines in page 53, whose author was fully mindful of the diverging paths of the "purposive" psychologist and the psychophysicist.

He called attention to the "scattering" phenomenon in mental tests, and regarded it as more marked in psychotic than in defect conditions. Language ability he found relatively superior in the defective, as it seems also to be in the psychotic. He often assigns a more general significance to the intelligence scale than is done now, though he freely compares it to a "rod" with which only one dimension of mind is measured. Motor suggestions seemed to him to "encroach less upon the personality" than sensory ones (hallucinations).

Amid the flowering of his work on feeble-mindedness, Binet's observations of mental disease have had little notice. It will pay the reader whose interests lie here, to follow up his generalization that "senile dementia tends towards destruction of the ideational life, with conservation of the instinctive part of the thought." The mental losses of organic psychoses he formulated in large part as a failure of ideas to become conscious and thus make themselves effective in action, though they are nevertheless present; a failure of *evocation*, it is called. The woman who after many fruitless attempts was finally got to count backwards from 20 to 1, "knew very well . . . since she finally succeeded; it is not therefore, the knowledge that is lacking but the comprehension of what is asked of her." The essential difference between the mind of the imbecile and that of the organic psychosis is that of insufficiently differentiated states of consciousness on the one hand, and weakness in evocation of more complex states on the other.

It is a pity that there is no carrying out here of the fruitful comparison between these organic failures of "evocation," and those

which contemporary psychopathology inclines to attribute to psychogenic suppressions.

F. L. WELLS

MCLEAN HOSPITAL

The Long Road of Woman's Memory. JANE ADDAMS. New York: Macmillan, 1916. Pp. xv + 168.

Miss Addams has written a book on several unrelated aspects of woman's experience and believes that in "Memory" she has found the unifying principle of them all. The fact that she fails in this does not detract from the value or interest of the book. The reader will find a presentation of Miss Addams's views on war, organized labor and other social problems, and an extremely interesting case of social suggestion which came under her observation for a long period of time, the rumor having spread that there was a "Devil Baby" at the Hull-House. If the psychologist can forget his business for the time being and adopt a non-professional attitude toward the book, he will find it interesting and instructive.

CARL C. BRIGHAM

PRINCETON UNIVERSITY

Love: A Treatise on the Science of Sex-Attraction. (2d ed.) B. S. TALMEY. New York: Practitioners' Publishing Co., 1916. Pp. x + 438.

Love is a text-book on the embryology, anatomy and physiology of the sex organs, and the pathology, psychology, hygiene and ethics of the sex-relationship. In treating these various aspects of sex Dr. Talmey has undertaken a comprehensive task, and has handled some parts of this task with comprehension.

The discussion of the psychology of sex is perhaps refreshing in that the author does not adopt the extravagances of the followers of Freud, but it is hardly illuminating. Dr. Talmey apparently has rather peculiar notions concerning the localization of function, for we find that the cerebellum is the seat of the sensations of touch, sight, smell and hearing, while the cerebrum is the seat of the "higher sensations," affection, admiration, worship and respect. We also learn that "all venereal troubles seem to exert an inhibitory influence upon the truth centers" (p. 177). The terminology is inexact and difficult to interpret. Among the "secondary mental characters" in man we find "manly will" and "manly grace." A novel eye condition is perhaps indicated by the description of

"the pupils in a state of hallucination." A long index is furnished for the convenience of the reader, and a bibliography is supplied which omits some of the references which are also omitted in the text.

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DISCUSSION

CONCERNING THE NUMBER OF OBSERVATIONS NECESSARY FOR THE DETERMINATION OF A LIMEN

Some time ago¹ we reported the results of an experimental study of the effects of practice in its initial stages in lifted weight experiments. The results show that the effect of this progressive practice is to increase the values of the coefficients of precision of both the lighter and heavier judgments and to decrease the values of both the interval of uncertainty and, to a less degree, of the point of subjective equality. The effects of this progressive practice are stronger at the beginning of the experimental series and decrease, at first rapidly and then more slowly, as the experimentation continues. In view of the effects of this influence of progressive practice in its initial stages, we recommended that, for anthropometric studies, not less than fifty judgments on each of five pairs of weights should be considered sufficient for the determination of a limen. This recommendation was our conclusion from comparing the limen values calculated from the data of the first 25, 50, and 100 judgments on each of 5 comparison pairs of weights. Although our recommendation of 50 judgments does not by any means eliminate the effects of this influence, still we look upon it as a *compromise* between time and accuracy, both of which are important factors for the anthropometrist and clinician.

Dr. Boring has opposed these recommendations.² In the first place Boring suggests that we are interested not in thresholds themselves but rather in *differences between* thresholds. Obviously then "the greater the difference we are seeking to establish, the fewer are the observations necessary to establish it." Hence we may determine in the first place the probable errors of each of the

¹ FERNBERGER, S. W. "The Effects of Practice in its Initial Stages in Lifted Weight Experiments and its Bearing upon Anthropometric Measurements," *Amer. J. of Psychol.*, 1916, 27, 261-272.

² BORING, E. G. "The Number of Observations upon Which a Limen May Be Based," *Amer. J. of Psychol.*, 1916, 27, 315-319.

two limens which we wish to compare and from these we may readily calculate the probable correctness of the difference between the two limens. This Boring calculates for a series of observations of dual sensitivity of the forearm and eyelid, a case where we might expect a large difference. Boring calculates the probable correctness of the difference in series of ten observations, and most of these have great significance, several indeed giving values of absolute mathematical certainty (unity). Boring then suggests that in dealing with the unpracticed observer, we must have a practice series until the reactions of the observer settle down to a point where the values of his coefficients of precision (h) reach magnitudes so that the probable correctness of the difference will become significant.

There are several points in connection with Boring's discussion which might be given further consideration. In the first place we wish to disclaim any intention of applying our recommendation of 50 judgments on each of five pairs of stimuli outside of the field of lifted weights. The actual number of observations necessary for the determination of a threshold may vary considerably for the different modalities of sensation, and even for different experimental arrangements within the same modality. Hence one must make an empirical determination for each experimental arrangement as we have done in the case of the determination of the difference threshold for lifted weights by the method of constant stimuli. But obviously the general principle remains even though the actual number of determinations might vary from case to case. We furthermore wish to state again that our recommendation was a mere compromise between accuracy and time, and we by no means believed that we were eliminating the influence of this factor by any such course.

To take up the different points suggested by Boring, we would in the first place heartily recommend the calculation of the probable correctness of the difference between two limens in the manner that the author suggests. But we believe that such a mathematical treatment has only more or less limited applicability. Let us first consider Boring's statement that we are interested, not in limen values, but in differences between limens. Theoretically this concept is unquestionably true. But it would superficially appear to be untrue from the practical standpoint. Let us consider the clinical case. For example Grabfield¹ determined the threshold

¹ GRABFIELD, G. P. "Variations in the Sensory Threshold for Faradic Stimulation in Psychopathic Subjects," *Bost. Med. & Surg. J.*, 1914, 171, 883-886.

for 135 psychopathic cases and found that these averaged 223 *B* units for the limen as determined by the Martin method for the measurement of induction shocks. He states that a threshold greater than 175 *B* units may be considered as definitely pathological. If this be true, and let us grant for the sake of argument that it is, then the clinician would appear to be *practically* interested in the fact that a certain subject gives a limen of 200 *B* units. The fact that his limen is 200 would certainly be of great practical interest to the patient.

Theoretically, however, it is quite another matter. Theoretically we are interested in comparing this individual threshold with a general *norm*, which has previously been empirically determined. But meanwhile what of Boring's method of calculation of the probable correctness of the difference between this individual limen and the general norm? Let us remember that the probable correctness of the difference between two limens is based upon the probable errors of each of them. It is an easy matter to determine the probable error of the limen which we have just determined, but what of that for the norm? Such a norm must be obtained by averaging the values of the thresholds of a relatively large number of subjects with a relatively large number of determinations from each. In such a case the work of obtaining the probable error of this average threshold would be a very laborious affair. It may, of course, be argued that, once this probable error of the norm has been obtained, we would have it for all time and hence could use it directly in all calculations for the probable correctness of the difference, provided of course that the individual threshold was obtained under identical experimental conditions.

Also, in the case of the clinician, we are using in the same calculation the probable error of a limen value obtained on the basis of a few experimental data, and the probable error—that of the norm—obtained on the basis of extensive empirical data. In other words, in the case of the norm we hope that our data are extensive enough so that all chance influences which may effect the determination will have cancelled one another and therefore will be eliminated. It is only on the basis of this belief that we are willing to consider that the value is a norm. But we can have no such assurance about the other threshold except by observing the size of the probable error—that same value which we are going to use in our future calculation of the probable correctness of the difference between the two thresholds.

In those cases where we are interested in the difference between limens, as in the case of Boring's example of the dual sensitivity of forearm and eyelid, we are also interested in the *amount* of that difference. It is true, for example, that we are interested in learning that the savage is more sensitive than the civilized man, but we are also interested in learning that the savage is *twice* as sensitive. We would point out that Boring's calculation of the probable correctness of the difference gives a true mathematical expression for the significance of the first of these questions only. It may well be that there is a significant difference between the two thresholds but this does not imply that the *amount* of difference obtained is correct with the same probability.

Finally let us return to the case where the individual threshold is compared with a general norm. The norm, it will be remembered, should be obtained by averaging the limen values from a large number of observations on each of a large number of subjects. From such a method only may we hope to eliminate the chance influences which may effect both the individual subject and the differences between subjects. In that case we find ourselves exactly where we started. The question which confronts us is: How many determinations are we going to require from each of our subjects whose results are to be utilized in the determination of the norm? We have already given a partial answer to this problem when we have stated that, in the case of lifted weights due to the effects of progressive practice, not less than 50 judgments on each of five comparison pairs of weights should be considered sufficient for the determination of a limen.

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NOTES AND NEWS

A NEW journal, *Mental Hygiene*, is being issued quarterly under the direction of the National Committee for Mental Hygiene, presenting non-technical studies of mental matters in relation to life problems.

DR. THOMAS H. HAINES, of the Ohio State University, has been granted five months' leave of absence to make a survey of mental

defectives in Kentucky, under the auspices of the National Committee for Mental Hygiene and the Rockefeller Foundation.

ANNOUNCEMENT is made of the appearance, about May 15, of the first number of a new bi-monthly journal, *Psychobiology*, which will be devoted to the overlapping portions of the fields of psychology, biology, and pharmacology. Professor Knight Dunlap, of the Johns Hopkins University, is the responsible editor.

DR. CARL C. BRIGHAM, instructor in psychology at Princeton University, has resigned his position to enter the Canadian service during the war. Dr. John J. B. Morgan has been appointed to fill the vacancy.

THE following items have been taken from the press:

PROFESSOR G. O. FERGUSON, JR., of William and Mary College, has been appointed associate professor of psychology and education in Colgate University.

DR. JOHN E. RUSSELL, of Williams College, died on February 26, in his seventieth year.

EXPERIMENTAL psychology has been made an obligatory subject for the licentiate in biological sciences in the University of Geneva, and the faculty of sciences has established a doctorate in the psychological sciences. Psychology is also included for the licentiate in the new faculty of economic and social sciences.

DR. GEORGE H. MAKUEN, of Philadelphia, has died at the age of sixty-one years. Dr. Makuen was widely known for his work on speech defects.

DR. GREGORY D. WALCOTT, of Hamline University, has been given a year's leave of absence to teach psychology and logic in the Government College at Tsing Hua, China.

THE Criminal Court of Chicago is to have a Psychopathic Institute as an extension of the Juvenile Psychopathic Institute. Aid has been obtained for the establishment of the institute from the Rockefeller Foundation, and Dr. Herman Adler is to be the director.

WORK has been begun with lectures and demonstrations at the new institute for experimental psychology at Constantinople, under the direction of Professor Anschütz, formerly of Kiel.

THE death of Professor J. Déjerine, of Paris, has been announced. Professor Déjerine was in his sixty-eighth year, and one of the foremost of the relatively large group of neurologists at Paris. He is well known for his contributions to clinical neurology, to anatomy and to néuropathology.

DR. LOUIE WINFIELD WEBB has been appointed instructor in psychology and education in Northwestern University.

DR. ELIZABETH L. WOODS has resigned as assistant professor of psychology at Vassar College to become director of Child Welfare at Pasadena, California.

THE California State Board of Health has prepared a bill providing for the establishment of a state psychopathic hospital in San Francisco, near the University of California Medical School.

A MEDICAL clinic for delinquent, nervous, subnormal, and abnormal children has been opened in the university hospital of the University of Minnesota.

DR. J. H. COFFIN, of Earlham College, is taking charge of the courses of Professor S. P. Hayes, of Mount Holyoke College, during the second semester.

THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

RECENT CONTRIBUTIONS TO THE PHYSIOLOGY OF THE AUTONOMIC NERVOUS SYSTEM

BY F. W. CARPENTER

Trinity College

The Nervous Mechanism of the Alimentary Canal.—The physiological study of the nervous mechanism of the stomach has been continued during the last two years by A. J. Carlson and his co-workers. Carlson and Braafladt (15) report experiments which afford evidence that the normal gastric mucosa is devoid of pain and tactile sensibility, but contains protopathic heat and cold nerve endings responsive to extremes of temperature. These endings are, however, more abundant and more readily stimulated in the pharynx and oesophagus. The authors reiterate their belief in a qualitative difference between hunger and appetite. Hunger they define as a complex of kinesthetic sensation (due to tension) and pain, while the term appetite is applied to a pleasanter, milder sensation turning one's thoughts to food in pleasurable anticipation. Their experiments indicate that these sensations may be called forth by the stimulation of entirely distinct nerve endings. Hunger, as has been repeatedly shown, is initiated in the normal empty stomach by strong contractions of its walls, and cannot be produced by any form of direct stimulation of the nerve endings in the gastric mucosa. The sensation of appetite, on the other hand, follows the excitation of the mucosa by chemical and possibly also by mechanical means. For example, appetite is experienced when such substances as hot or cold water, weak acids or weak alcohol are introduced through a tube into the stomach so as to avoid stimulation of

nerve endings in the mouth and œsophagus, which, under normal conditions, play a large part in bringing about the sensation, and are especially concerned in the memory factor. The authors believe that the sensation of fullness after eating is due to the tension exerted from within on the circular muscle fibers of the stomach following a tonus relaxation of these fibers. They find that the stimulation of the gastric mucosa with hot or cold water causes vasoconstriction in the arm if the subject is awake, but not if he is asleep. Changes in vasomotor tonus are, therefore, attributed to the influence of conscious cerebral processes induced by the gastric activity. The reflex excitability of the spinal cord is increased by stimulation of the gastric mucosa, much as it is by the hunger contractions of the empty stomach.

That hunger contractions are simply augmented peristaltic contractions is the view of Rogers (44) and Rogers and Hardt (47). Studies of the latter on man and dog show that the stomach during normal digestion exhibits a slow tonus rhythm which becomes more vigorous as the stomach empties itself, and finally gives rise to the periodic hunger pangs. Excitement, interest, worry, or any strong psychic influences immediately inhibit this rhythm. "Psychic inhibition" appears, however, to play an unimportant rôle in the control of the hunger mechanism in such stolid animals as guinea-pigs (King and Connet, 27). The stomach contractions in these animals proceed with regularity in spite of noises, voluntary movements, etc. But in decerebrate guinea pigs the contractions show a marked increase in rate, which seems to indicate that a certain degree of inhibitory control is removed with the destruction of the cerebral cortex, and also that the positive (excitatory) influence of the brain on stomach motility originates below the cerebrum.

From observations on a sleeping dog Luckhardt (31) concludes that the cerebral activity associated with dreaming greatly diminishes the hunger contractions of the empty stomach, which during deep and apparently dreamless sleep occur with regularity and vigor. The author assumes that movements of the limbs, tail and muscles of the face during sleep give evidence that a dog is actually dreaming.

Rogers (45 and 46) reports that the crop of pigeons deprived of food exhibits hypermotility, and that this vigorous activity is checked by "any conditions causing fear or surprise," and also by lesions of the cerebellum and membranous labyrinth, as well as by

the taking of food or water. In decerebrate birds no inhibitory reactions were obtained from non-painful external stimuli, but such reactions followed intrinsic painful stimuli or injury of the equilibratory apparatus. Hunger, thirst and sometimes intestinal impulses aroused the decerebrate pigeons to restlessness.

Brunemeier and Carlson (4) find that gastric hunger contractions in dogs may be inhibited for varying periods by introducing food or other materials through a fistula into the small intestine. The inhibition takes place primarily through reflexes involving the vagi, the central nervous system and the splanchnics, although the local enteric nervous apparatus plays a minor part in the reaction.

Comparative studies of the hunger mechanism of the frog and turtle were made by Patterson (34) and (35). That of the frog appears to be relatively simple and automatic. Hunger movements are not affected by the removal of the cerebral hemispheres. Differences in the irritability and latent period in various regions of the stomach wall of the frog and rabbit were investigated by Alvarez (1).

The secretion of gastric juice in man is, according to Carlson (13), a continuous process not dependent upon direct nervous stimuli, but probably maintained by the secretory tonus of the vagus nerves, and possibly also by the action of secretagogues yielded by the autodigestion of the gastric juice itself. Such psychic forms of "stimulation" as seeing, smelling and even merely thinking of palatable foods usually produce only a slight and very transitory increase in the secretion of gastric juice.

Carlson (14) brings together in a single volume entitled, *Control of Hunger in Health and Disease*, much recently acquired information concerning the functioning of the nervous mechanism of the digestive organs.

Internal Secretions and the Autonomic System.—Physiologists continue to be interested in the relation between emotional states and the secretion by the adrenal glands of epinephrin, which, circulating through the body in the blood stream, stimulates the sympathetic nervous system, and thus produces widespread results, all of which tend to prepare the body for action. Stewart and Rogoff (51) criticise Elliott's conclusion that "fright" in cats, induced by the administration of morphine or β -tetrahydronapthylamine, causes the diminution of the store of epinephrin observed in the adrenals after such treatment. They give evidence for regarding the effect on the adrenals as due to some action of the drug other than the hypothetical emotional disturbance. Hartman

(22) finds that the same dose of dilute adrenalin causes dilatation of the peripheral arteries and constriction of the splanchnic arteries. This differential response of blood vessels to adrenalin is in accordance with their functional use in times of excitement. The voluntary muscles are thus insured an abundant blood supply for their most efficient action. When adrenalin is injected intravenously into dogs, Hoskins, Gunning and Berry (25) report active dilatation of the blood vessels of the limb muscles and constriction of the cutaneous vessels. Hoskins (23) removed portions of the adrenal tissue of dogs, and noted that the partial adrenal deficiency resulted in a depression of the irritability of the sympathetic nervous system proper. Hoskins and Rowley (26) found, contrary to their expectations, that infusions of adrenalin in anesthetized dogs failed to augment vasomotor irritability or facilitate the transmission of vasomotor impulses. On the contrary vasomotor irritability was, in most cases, lessened. The authors think it probable that under ordinary conditions epinephrin does not exist in the circulating blood at all. Under conditions of special stress, however, when the adrenal glands are discharging relatively large amounts of their secretion into the blood, the depressing influence as compared with the stimulating effect would be slight and probably negligible. Gley and Quinquand (21) were unable to demonstrate any direct relation between the adrenal secretion and the vasomotor function of the splanchnic nerves. Intravenous injections of physiological amounts of adrenalin in dogs has a two-fold effect on the heart rate according to Meek and Eyster (33). The adrenalin accelerates the heart by direct stimulation and at the same time inhibits it reflexly through the vagus. The net result of this balanced mechanism is always, under ordinary conditions, a decrease in the heart rate. But in exercise pushed to an extreme, when the body is in great physiological need, the accelerating effect of the adrenalin dominates.

Kuroda and Kuno (28) report that injections of adrenalin decrease the excitability of the vagus. Richards and Wood (43) carried out experiments on rabbits which showed that stimulation of the depressor nerve results in a decrease of the rate of discharge of epinephrin from the adrenal gland. The mechanism of adrenal secretion appears, therefore, to be involved not only in pressor but also in depressor reflexes. The inhibition of secretory activity is due to nervous influences exerted directly upon the secretory structures, and not to changes in the blood flow through the gland. The

epinephric content of the blood was measured in dogs by Bedford and Jackson (3) under conditions of low blood pressure and "shock." They interpreted the data obtained to mean that under such conditions there is an increased activity of the adrenal glands.

Cannon and Cattell (11 and 12) have devised a method of using electrical responses as an index of glandular action. By means of this they have determined that the thyroid gland is innervated by fibers belonging to the sympathetic (thoracico-lumbar) and not to the cranial division of the autonomic system. These fibers are truly secretory in function; the effects are not brought about indirectly through alteration of the blood supply. The authors also find that epinephrin, liberated from the adrenals into the circulating blood by nervous stimulation, evokes secretory activity in the thyroid. It would appear, then, that in times of excitement the epinephrin discharged through "emotional stimulation" of the sympathetic nerves, includes among its various effects the excitation of the thyroid gland, the augmented secretion of which may play an emergency function in regulating the metabolism of the body under the changed conditions. The results of Cannon and Cattell are confirmed by Levy (30), who adds the observation that the thyroid secretion renders more excitable those sympathetic structures which are acted on by epinephrin in raising arterial pressure.

The stimulating action on the autonomic system of the internal secretions of glands other than the adrenals and thyroid has been studied by a number of workers. Shamoff (49) finds that extract of the posterior lobe of the pituitary body inhibits the rhythmic contractions of the isolated intestinal loop, presumably by affecting, like adrenalin, the sympathetic nerves (inhibitory) supplying the loop. Extract of the pituitary gland was observed by Waddell (53) to have a depressing effect on both the circular and longitudinal musculature of the frog's oesophagus. The secretory discharge of the gland can be called forth by stimulating the superior cervical ganglion of the sympathetic trunk (Shamoff, 50). Injections of extract of the pineal gland bring about in growing rabbits, according to Del Priore (17), a marked lowering of the blood pressure. The internal secretions of the testis are believed by Wheelon and Shipley (54) to have a direct effect upon the sympathetic nervous system. Their experiments afford evidence that castration results in a depressed activity of the sympathetic mechanism, while restitution of the testicular tissue by the method of implantation tends to lift the depression, and at least partially to restore normal activity.

The relation between pancreas deficiency and vasomotor irritability was studied by Hoskins and Gunning (24), whose conclusion is that there is little evidence to support the theory that the pancreas normally exerts, through the action of its hormones, a depressing influence upon the sympathetic. Streuli (52) discusses at length the action of the various internal secretions upon structures under autonomic control. Schafer (48) considers as still open the question of the influence of calcium ions in the circulation upon the irritability of the autonomic system, but is convinced that calcium deficiency has a depressing effect.

The Vasomotor Mechanism.—On the basis of experiments with curare Porter (37) argues for the existence in the medulla of separate, although related, centers for vasotonus and vasoreflexes. Porter and Turner (38) in a later paper describe vasomotor phenomena, following the injection of certain doses of alcohol, which they believe could not occur if the central vasotonic and vasoreflex mechanisms were identical. Martin and Stiles (32) are of the opinion that depressor and pressor influences act upon different parts of the central mechanism which controls reflexly vasomotor activities.

New evidence of the presence of a chief vasoconstrictor center in the medulla is presented by Ranson (40), who traces the course of the afferent and efferent limbs of the pressor reflex arc in the cord. The former is described as following the apex of the posterior horn, the latter as lying in the lateral or ventral funiculus. Ranson and Billingsley (41 and 42) report further studies on the vasomotor reflex arcs. The afferent spinal path for depressor reflexes is placed in the lateral funiculus. It is pointed out that a separate vasodilator center may exist, and its probable position in the floor of the fourth ventricle is given with some precision.

Burton-Opitz (5) finds by experimental methods that the nerve fibers which innervate the blood vessels of the central duodenum ascend from the coeliac ganglion by way of the plexus gastro-duodenalis and the plexus pancreatico-duodenalis. The same author (6) questions the validity of Mall's conclusion that the portal vein is innervated by venomotor nerves. In a third paper (7) he gives reasons for regarding the vasomotor innervation of the kidneys as unilateral, the direct vasomotor influence of the splanchnic nerve of one side of the body being restricted to the kidney of that side. Burton-Opitz and Edwards (9) obtained in the dog experimental results which indicate that the sympathetic trunk embraces vasoconstrictor fibers governing the vascularity of parts not included

within the distribution of the greater and lesser splanchnic nerves. The greater splanchnic is regarded by Burton-Opitz (8) as the depressor for the abdominal organs, since it serves as an afferent path for nervous impulses which bring about a general vasodilatation. Vasomotor nerves are present in the bone marrow according to Drinker and Drinker (18). These nerves cause vasoconstriction when stimulated electrically or by the injection of adrenalin.

The Vagus Nerve.—Various functions of the vagus nerve have been recent objects of investigation. Eiger (19) has demonstrated its direct secretory influence on the cells of the liver. Further details of the inhibition of pancreatic secretion through stimulation of the vagus are given by Anrep (2). The blocking of the discharge is said to be due to constriction of the pancreatic ducts or to retention of the juice in the glandular cells which secrete it. The accumulation of the secretion causes an evident dilatation of the gland. Pearce and Carter (36) were unable to detect any change in the oxygen consumption of the kidney during stimulation of the vagus fibers supplying that organ. They regard this as evidence against the supposed existence of renal secretory fibers in the vagus. According to Ranson (39) the nerve fibers which subserve the protopathic temperature sense of the gastric mucosa are to be recognized in the non-myelinated afferent fibers of the vagus distributed to the stomach. The cell-bodies of these fibers are situated in the ganglion nodosum. It has already been noted that Kuroda and Kuno (28) find the excitability of the vagus lessened by injections of adrenalin.

General.—Langley (29) gives a sketch of the progress of discovery in the field of the autonomic nervous system during the eighteenth century. In his book entitled *Bodily Changes in Pain, Hunger, Fear and Rage*, Cannon (10) describes and discusses at length his recent researches into the physiological function of emotional excitement. He sets forth his views regarding the effect of the emotions through the autonomic system on digestion and adrenal activity, and traces the influence of the augmented adrenal secretion on muscular fatigue, the mobilization of blood sugar, and the coagulation time of the blood. He emphasizes the utility of the bodily changes brought about by pain and great emotion, and closes with a timely chapter on "alternative satisfactions for the fighting emotions." *The Origin and Nature of the Emotions* by Crile (16) is a volume comprising a number of articles which deal with various aspects of the subjects from the standpoint of a medical man with clinical experience, a mechanistic outlook on life, and a

lively interest in the phylogenetic interpretation of psychological and pathological phenomena. The monograph by Gaskell (20) on *The Involuntary Nervous System* has already received notice in this journal.

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CEREBELLUM AND BRAIN-STEM¹

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The book by André-Thomas and Durupt (1) was not accessible to the reviewer but is referred to in a footnote by Black (3) as presenting the results of the researches of the authors on cerebellar localization on dogs and monkeys, "together with an interesting and detailed review of the subject in all its phases and an extended bibliography." Black (3) gives a brief review of recent work tending to support the hypothesis, to which the late Max Rothmann gave much attention, that there exists specific cerebellar cortical localization of function analogous to that of the cerebral cortex. Meyers (12) feels it to be established that the traditional forced movements, etc., of animals subjected to cerebellar operation are not cerebellar in origin but are due, rather, to the inclusion of the

¹ For the last previous review on this topic see the BULLETIN, 1915, **12**, 145-148.

vestibular complex or its oculomotor tracts. The phenomena of true cerebellar genesis he takes to be ataxia and tremor, since there are constant and marked symptoms found in lesions limited to the lateral lobes of the cerebellum without involvement of the vestibular complex. He has furthermore never been convinced of the existence of hypotonia in cerebellar lesions. However all this may be, Meyer's own experimental work, based on the fact that active tissue is invariably electrically negative to resting tissue, offers several points of interest. First, he established the fact that after removal of one of the lobes of the cerebellum the motor nerves (the sciatic or the ulnar) on the side of the lesion were negative to those of the uninjured side. Secondly, in animals with one lateral cerebellar lobe and the contralateral motor area of the cerebrum removed, he found no galvanometric deflections whatever. Control animals, however, with the contralateral cerebral motor area intact, but with large other cerebral areas removed, showed the characteristic negative variation identically the same as in the earlier animals in which a cerebellar lesion alone had been produced. Meyers concludes, therefore, that the cerebellum has no direct motor effect on the musculature but acts as an inhibitory organ on the cerebral motor areas. When, for instance, one lateral cerebellar lobe was removed and the contralateral cerebral motor area left intact, the muscular reactions on the side contralateral to the motor area exhibited all the usual signs of hyperexcitability or of the release of inhibitions—excessive, forcible and unchecked movements, overshooting the mark. The phenomena usually ascribed to cerebellar deficiency are thus really phenomena of hyperactivity of cerebral motor areas, paracerebellar nuclei in the medulla, etc. The cerebellum is a purely afferent mechanism. These are interesting hypotheses but so variant from the usual conception of cerebellar function as to require further experimentation and control. In a later article Meyers (13) argues that if his previous findings are valid the problem of cerebellar localization should be studied through the medium of the motor cortex of the cerebrum. He accordingly subjected certain lobules of the cerebellum of the cat to small circumscribed lesions and, after good recovery, injected small amounts of oil of absinthe into the external jugular vein. It is well known that in normal animals such treatment produces marked convulsions simultaneously in all the muscles of the body. In the case of the cats with operative cerebellar lesions Meyers found that in certain muscles—in general those functionally related,

according to Bolk's theory of cerebellar localization, with the lobules subjected to lesion—there appeared either a greater intensity of convulsion than in the other muscles, or that such muscles alone showed convulsions, the rest of the body being quiescent. Cerebellar functions are thus “differentiated for the various muscle groups of the body, indirectly, by being primarily related through its various lobules to the various motor centers in the cerebrum and the tonus centers in the medulla.” Rothmann (15) briefly reports certain experimental results on cerebellar localization in the dog. In one animal the lesion was in the anterior part of the posterior median lobe and after eleven months the only symptom noticed was a “Neinschütteln des Kopfes.” In another animal, with total removal of the cortex of the vermis, with hemispheres and nuclei intact, ataxia of the head, trunk, and extremities was pronounced during the three and a half months that the dog lived, and the bark reflex was absent. Postural disturbances of the extremities were, however, not in evidence; these are to be referred, in part at least, to the hemispheres themselves. Bikeles and Zbyszewski (2), on applying from 2 per cent. to 5 per cent. solution of cocaine to the motor area of the cerebrum, found marked decrease in sensitivity of response to electrical stimulation. The same applications to the crus secundum lobi ansiformis of the cerebellum had little or no effect at all on its responses.

On the functions of the brain-stem the more recent work of the indefatigable Brown has some bearing. In one series of experiments (4) he demonstrated that stimulation of points at a cross section of the mid-brain of a decerebrate chimpanzee just anterior to the superior colliculi and involving the red nucleus evoked reactions similar to those already described for monkeys,² *i. e.*, postural contraction of flexors of ipsilateral arm and of extensors of contralateral arm. In the chimpanzee, however, certain variations were noticed, *e. g.*, at times the ipsilateral effect was chiefly extension and the contralateral chiefly flexion. The results are puzzling to the author and may conceivably be due either to a spread of the stimulus from ipsi- to contralateral area (or vice versa), or to a double action of each red nucleus, its flexion effect at times masking its extensor effect, or the reverse. A second investigation (5) offers some evidence that states of *plastic* postural flexion (allowing passive alteration of the state of contraction—opposed to rigid flexion) met with in experimentation on cerebellar motor areas is really due to the action

² See review in BULLETIN, 1915, 12, 146.

of the red nucleus. In another experiment (6) on the same chimpanzee mentioned above the stimulation of certain circumscribed areas of structures probably lying in or near the caudal pole of the thalamus yielded alterations in breathing and blood pressure characteristic, in the intact animal, of various emotional states—"panting," "sighing," or "hollow" breathing and, particularly, the rapid "laughter" breathing. The experiment, says Brown, gives definite proof of the connection of the caudal pole of the optic thalamus with activities which condition reactions expressive of emotional states. In a further experiment (7) Brown secures primary facilitation (repeated stimulation of the same point producing progressive augmentation of the extent of muscular reaction) on stimulating (1) the gray matter of the cortical motor area, (2) the nerve-fibers of the cortico-spinal tract just below the cortex, (3) the same fibers lower down in the internal capsule and, (4) at the level of the mid-brain. The question then arises whether this facilitating mechanism is located only in sub-cortical structures (the phenomena, when obtained by cortical stimulation, thus depending on its sub-cortical effects) or in both cortical and sub-cortical structures. That it lies at least sub-cortically the investigation amply proves. But it is also probable that primary facilitation occurs in the cortex itself. The author had previously (8) shown, namely, that secondary cortical facilitation (the augmenting, by repeated stimulation of a given cortical point, of the responsiveness of similar neighboring cortical points) has a cortical seat. This means, however, that the excitability of the secondary points is raised by repeated natural stimuli, although the source of these stimuli is in the neighboring primary point. Hence there is every reason to suppose that primary facilitation may also have a cortical as well as a sub-cortical location. The proof does not appear quite convincing, but is interesting.

Ranson (14) adduces certain experimental evidence (on cats) to show that there is a vasoconstrictor center somewhere in the brain, the pressor reflex-arc not being complete, therefore, within the cord—a matter hitherto in doubt. Miller and Bowman (11) report an investigation which serves to locate the cardio-inhibitory center in the dorsal vagus nucleus—a result in harmony with previous histological findings of Kohnstamm and of van Gehuchten and Molhant.

Articles by Grey (9, 10) and Schaller (16) were not accessible to the reviewer.

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REFLEX MECHANISMS AND THE PHYSIOLOGY OF NERVE AND MUSCLE

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The greatly reduced investigation on these topics in 1916 seems to yield but three papers on reflex mechanisms. Ranson and Billingsley (12) identify the cutaneous "protopathic" system of Head with certain unmyelinated fibers of the posterior spinal roots. In

1912 Ranson published his discovery of unmyelinated fibers in the dorsal roots. These are mostly cutaneous nerves, and they practically all enter the cord in bundles which lie laterally to the myelinated fibers of the same root. The former are called by Ranson the "lateral division" of the dorsal root. A much smaller number of myelinated fibers is found also in this lateral division. All the neurones of the lateral division run up or down, in Lissauer's tract, a very short distance—usually less than a segment. "That is to say, these fibers run into the gray matter at or near the level at which they enter the cord. Their intraspinal course suggests at once that they are the fibers of pain and temperature sensations, since it is known that the afferent impulses underlying these sensations pass through the gray matter as soon as they reach the cord." The authors' experiments consist in studying the vasomotor and other responses to pain and temperature stimulation of the skin, in cats in which either the lateral or the medial division of the posterior root has been cut. It is concluded that the myelinated fibers of the lateral division represent the epicritic, and the unmyelinated fibers the protopathic, afferent cutaneous systems of Head.

Brown contributes two more papers (3, 4) in his series of 1914-15. Apart from a study of motor responses elicitable by unipolar stimulation of the post-central convolution (in 4), both papers deal mainly with primary and secondary facilitation. Repeated "subliminal or just liminal" stimulation of a point in the motor region will gradually raise its excitability ("primary facilitation"); and the excitability of neighboring cortical points is raised at the same time ("secondary facilitation"). This latter is due to stimulation of the underlying association fibers, and not merely to a spread of the electric current as such to the surrounding brain tissue (3). It seems not unlikely that facilitation is closely related to the psychologists' phenomenon of summation of sensation.

In the field of nerve and muscle physiology, Bethe (2) offers a general theory of irritability which is based on the phenomenon of capillary action. In this theory, which is explicitly proposed as an alternative to the Nernst theory, the "semi-permeable membrane" of Nernst is taken to be a fixed reticulum the perforations of which give rise, by capillarity, to exchanges between liquids on opposite sides of the network. One of the crucial statements is most safely quoted without translation: "*Durch Adsorption von Ionen am Material der Porenwände (oder auch durch Komplexbildung) wird*

hier im Prinzip dasselbe erreicht wie dort [the Nernst theory], nämlich eine Behinderung in der Beweglichkeit gewisser Ionen" (p. 153). Of the effects which "capillary" action will produce Bethe lays most stress on changes of H-ion concentration: "It seems at least probable that increase or decrease of the H-ion concentration directly modifies the irritability of living tissue, and in such wise that an increase excites, or increases the irritability, a decrease reduces the same" (p. 171). Electrical, mechanical, and chemical modes of stimulation are discussed from this point of view, and although the author concedes that at present the capillary theory can be given no mathematical formulation, he adduces in support of it several lines of evidence; such, as for instance, the reversibility of galvanotactic response in microorganisms by variation of the salt concentration in which they are placed. There is a somewhat interesting criticism of the Nernst theory (pp. 148-155). In connection with either theory it is perhaps worth while to consider whether it sufficiently takes account of the fact that stimulation is, in muscle certainly and in nerve probably, a process of *release* of stored chemical energy.

Lillie (9) has added a third section to his study of the theory of conduction in irritable tissues, in which he further explains "the theory that the transmission of the excitation-state from the immediate site of activity to the adjoining resting areas is dependent on an *electrical local action* of the same essential nature as that which is responsible for the etching or corrosion of non-homogeneous metallic surfaces (for example, of iron) in contact with an electrolyte solution: . . . this local circuit, having once originated, produces effects similar to those of any other electrical current upon the adjoining portions of the irritable element; at the still resting regions the direction of the current entering the cell-surface from the external medium is such as to cause local depolarization, an effect resulting, if sufficiently intense, in stimulation. This secondarily stimulated region produces similar effects at the region beyond; hence the excitation-effect *spreads*, . . . at a rate determined by the temperature, the composition of the medium, and the specific peculiarities of the tissue. . . . The changes associated with excitation (negativity and increased permeability) are rapidly and automatically reversed when the wave of excitation reaches any region of the element. Thus in the typical irritable element like nerve the local excitation-process is automatically self-limiting. The high velocity of transmission is apparently a function of high

irritability—*i. e.*, promptness and rapidity of local change, and great sensitivity to variations of surface-polarization—and its conditions have been discussed in the first paper of this series. With regard to the self-limiting characteristic, there is every indication that this is at bottom nothing but an expression of the well-known polar action of the electrical current upon such tissues—*i. e.*, inhibition where the current enters the element (at the anode of the electrodes from an external source of current), and stimulation where it leaves. . . . The current of the local active-inactive circuit has such a direction that at the original site of excitation the positive stream *enters* the cell-surface from the medium, while at adjoining regions (not yet excited) it leaves. . . . The precise metabolic basis of these changes cannot be indicated at present.” The work of Lillie, like that of Lapique and Hill, is partly based on the Nernst theory, and aims to extend the latter and to make it more precise.

The late Keith Lucas held the local excitatory process and the propagated disturbance, in nerve, to be distinct; and he believed that the former did not exhibit the refractory phase which is characteristic of the latter. From his latest investigation Adrian (1) concludes that during the absolute refractory period both processes (local excitation and conduction) are in abeyance, and that “the nerve regains its power to conduct impulses at the same moment at which it recovers its excitability to strong external stimuli. . . . This removes a possible objection to the theory that conduction is due to a spread of the excitatory process.” The above-mentioned theory of Lillie seems to favor this latter view.

Forbes, McIntosh, and Sefton (6) state that “in all experiments with general anæsthesia it as found that muscular contraction in response to motor nerve stimulation remained vigorous at all depths of anæsthesia, even after respiration had ceased altogether.” With direct stimulation of motor nerve, under extreme ether anæsthesia, they find that muscular contractions disappear slightly earlier than the action current. “The action current is probably a valid criterion of function” in nerve, and is probably an inseparable feature of the nervous impulse.

Cannon and Gruber (5) describe “wave-like variations in the height of contraction” which “are obtained from mammalian muscles under rhythmical and uniform stimulation.” These are most pronounced in fresh and vigorous muscles; “they occur too soon to be the result of a fatigue process; . . . they gradually decrease in rate as fatigue approaches and the height of the muscular

contraction becomes low. . . . The muscle waves are observed in curarized or isolated or denervated muscles; in the body they do not coincide with waves of arterial pressure. They are, therefore, strictly of muscular origin."

Relatively slow waves of contraction can sometimes be seen travelling along a muscle fiber, and sometimes on arriving at the end they are reflected back again. These have been described by previous observers, under mechanical and electrical stimulation, sometimes under stimulation from the nerve, and in dying muscle. Langley (8) now describes such slow waves of contraction produced by chemical stimulation. The underlying metabolic process is obscure.

Münnich (10) has reviewed the various measurements of the rate of propagation of impulses along motor nerves, and has made new measurements of the same (cat, dog, man). In three dogs the mean measurements were 61, 85, and 88 meters per second. In man the means ranged between 66 and 69.3 m. per sec. These figures agree more closely with the early measurements of Helmholtz and Baxt (64.56 m.) and Alcock (66.8 m.) than with Piper's more recent figure (120 m.). In a somewhat complicated paper Pauli (11) reports that the demarcation current behaves, under the influence of cooling and warming, *alike* in nerve and in muscle. He ascribes the demarcation current, in both cases, to the presence in the injured portion of the tissue of "*elektromotorisch wirksame Elektrolyten*."

Langley (7) has studied the loss of weight and atrophy of denervated muscle as affected by passive flexions, or by condensor shocks, applied for 2½ hours daily for 30 days. "It is clear from the results . . . that neither electrical stimulation nor passive movement had any definite effect in preventing loss of weight" of the muscle. "It may fairly be concluded that the atrophy of denervated muscle is not due to the absence of contraction. . . . It does not however follow that stimulating denervated muscle may not have a slight beneficial effect." Langley believes that the atrophy which appears within one or two months after denervation is not a true atrophy of disuse.

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SPECIAL REVIEWS

Health and Disease: Their Determining Factors. R. I. LEE. Boston: Little, Brown, 1917. Pp. xv+378. \$1.75.

Although the present work does not deal with psychology it is of interest to note that it shows the tendency to give to psychological matters more emphasis than is usually given in text-books dealing with hygiene, and this indicates a spreading appreciation of the importance of the mental factors in disease. In fact one chapter of the book deals with the hygiene of the mind, although it should be stated that this is only three pages in length and not more than one of those can strictly be called mental hygiene. Other chapters of interest to psychologists deal with heredity, with exercise and work, including sleep and dreams, with the effects of alcohol, tobacco, and the habit-forming drugs, and with light and its effects upon the eyes.

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Backward Children. A. HOLMES. Indianapolis: Bobbs-Merrill, 1915. Pp. 241.

This book is a popular study of specific cases of backward children giving some idea of different types of backward children who are not feeble-minded, and urging the careful examination and training of these children. It is true, as the editor states, that the book is "particularly free from technical or professional terminology so that the layman can read it with ease," but surely it is not true that the "parent, teacher, medical inspector or clinician can use Dean Holmes' book in much the same way that a botanist, say, would use a key to the flower he is identifying and classifying." The author, indeed, contradicts this statement of the editor for he says (p. 138): "As soon as mental retardation is suspected, a diagnosis ought to be made by a specialist. . . . None but a specialist in mental retardation is fitted to make it."

In his first chapter, "Measuring rods for children," Dean Holmes gives examples of children measured by "individual standards" and by the "social standards in the home," and discusses the "more accurate standards,"—the pedagogical standards of age and grade and of progress in school, the standards of the playground and the Binet-Simon standard. Without having found any definite statement of the comparative value of the different standards, we are left with the impression that individual standards are useless, that home and school standards often give contradictory results, and that the Binet-Simon scale is often misleading, but that "not too much weight can . . . be given to the place secured by a child in his own world of unsupervised play."

The greater part of the book consists of descriptions of cases typical of different types of backwardness. The descriptions generally include personal appearance, behavior in school and at home, the causes and treatment of the backwardness. In spite of the emphasis laid upon the point in the first chapter, little or no mention is made of the "place secured by a child in his own world of unsupervised play" and no mention is made of results of Binet examinations. The standards used seem to be almost wholly pedagogical. Children are classed as temporarily and permanently backward. Cases are cited in which temporary backwardness was due to (1) physical defect, (2) a slow mind, (3) a concrete mind, (4) lack of interest in lessons, (5) badness, (6) environment, (7) lack of home training. Dean Holmes then goes on to discuss home training, discipline and feeding.

A chapter on "The clinical diagnosis of backward children" states the question to be solved not as "What is the child now?" but as "What will he be at puberty when all his mental faculties have reached their maturity?" A thorough examination is to include an oral examination concerning his pedagogical history, his personal history (capacities, moral character, diseases, etc.), his family history; a physical examination; and mental tests, both pedagogical and non-pedagogical (such as Binet tests) and a vague un-illustrated group of tests for specific defects in particular mental processes. The chapter concludes with a short discussion of feeble-mindedness.

In the following chapter the teacher is warned not to judge by external appearances, but to discover how much the child knows, in what his interest lies, to study his temperament, to find out how he "perceives, remembers, imagines, and reasons." The book closes with a discussion "The teacher and equipment for a special class." After a long description of a special class teacher who turned out better than was expected, we read of the attributes, temperament, training and experience required, and, then, a detailed list of suggested equipment.

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DISCUSSION

CEREBRAL ADAPTATION VS. CEREBRAL ORGANOLGY

Over a hundred years have passed since the publication of Gall's system, and over fifty years have gone by since Broca reported his celebrated case of motor aphasia. Both of those contributions have had much to do with the formulation of the now widely accepted hypotheses regarding cerebral function, although it might be difficult to get the admission of the close relationship with Gall from those who hold to the simple current teachings. Several years ago I made an examination of the cerebral physiology contained in some of our widely used American text-books and monographs of psychology and physiology, which revealed to me the prevalence of an organology view, not entirely unlike that against which I have protested.¹ In most cases it was obvious that Sherrington's "Integrative Action of the Nervous System" (published in 1906) was known, but in some it was equally obvious that its

¹"New Phrenology," *Science*, 1912, 35, 321-328.

lessons had not been understood. The cerebrum as a collection of spatially related conglomerates of cells and fibers, each conglomerate having a certain function (perhaps mental) is easily apprehended by the instructor and easily taught to the student. As a mechanism with interrelated parts it is not readily understood, because the mutual relations (anatomical and functional) of some of its parts are not known. This can best be understood by considering what I have been calling the "negative" facts, and we now have a number of such facts which must be given due attention. To some of these facts I have previously called attention,² but their importance warrants repetition. The latest is contained in a recent paper by Brown and Stewart which will be referred to below.³

The results of Vitzou⁴ obtained in experimental destructions of the so-called visual cortex of the monkey's brain (temporary blindness but with eventual recovery of the ability to see) are first to be cited. Assuming that the destructions were complete, it is not possible to understand these recoveries from the standpoint of cerebral organology, for the cortex is looked at as a locus of certain physiological processes which give rise to or which are coincident with the mental states (sensations or perceptions). The second fact which may be cited is that of recovery of "voluntary" motor ability after the destruction of the so-called motor cortex or of the fiber connections. In a recent paper I have called attention to this fact,⁵ for it was found that even though a paralysis had existed for a dozen years or more some functional return could be brought about. Some doubt may exist that in the cases which have recovered there has been an actual destruction of the motor cells or fibers, although the clinical conditions were those which have been found in cases of "organic" paralysis. Such a doubt cannot exist for experimental work on animals, some of which will be reported shortly,⁶ in which the motor areas were destroyed by a thermo-cautery. In these animals the destructions were immediately followed by a typical hemiplegia which disappeared under suitable treatment within

² See pp. 19-21 of my monograph, *The Occipital Lobes*, PSYCHOL. MONOG., 1911, No. 56.

³ T. G. Brown and R. M. Stewart, "On Disturbances of the Localization and Discrimination of Sensations in Cases of Cerebral Lesions, and on the Possibility of Recovery of these Functions After a Process of Training," *Brain*, 1916, 39, 348-454.

⁴ See p. 19, of the monograph cited, with references.

⁵ Franz, Scheetz and Wilson, "The Possibility of Recovery of Function in Long-Standing Hemiplegia," *J. of Amer. Med. Assn.*, 1915, 65, 2150-2154.

⁶ Franz and Oden, "On Cerebral Motor Control: The Recovery from Experimentally Produced Hemiplegia," *Psychobiology*.

four weeks. In these cases, also, we were able to get recovery from a hemiplegia on the right side, and after producing a cortical hemiplegia on the left side we obtained a complete restitution of the function on that side. In these cases, therefore, the functional restitution was not brought about by the assumption of the function by the corresponding opposite hemisphere. The latter conclusion, namely, that when there is restitution of function this is brought about by the assumption of a bilateral control by the remaining normal corresponding area of the opposite hemisphere, is the favorite explanation of the functional return, or recovery, of speech ability in aphasics. In that class it has long been known that suitable training brings about an ability to understand (if the patient be a "sensory" aphasic) or an ability to vocalize (if the patient be a "motor" aphasic). Few careful studies of the course of reëducation of aphasics have been published,⁷ but an investigation now in progress shows that the learning is very slow, much like that of an activity not previously acquired even in its elements.

To these facts which show that there is a possibility of recover of motor, visual, and speech functions after the destruction of those cerebral parts which are thought to be normally concerned in them, there is now added the work of Brown and Stewart on the recovery of the ability of tactile localization after the destruction of the post-central cortex. Their subject was a man who had been wounded in such a manner that his ability of localization had been much reduced or lost. At first the patient was aphasic and hemiplegic, and they began their experiments fourteen months after the accident, during which time the patient exhibited the abnormal condition of not being able to localize tactile stimuli when given to the right hand. The training consisted in touching a part, and telling the patient where he had been stimulated and getting him to pay attention to the conditions. Since previous tests had been made to determine the accuracy of his localization ability it was possible to determine after the period of training what improvement had taken place. In the words of the authors: "Marked improvement of the localization of tactile stimuli on the trained spots as compared with the accuracy of that localization on the same finger before the training, and with the accuracy of localization upon the other fingers after the training" indicates that there has been a functional recovery.

⁷ See on this point my paper, "The Reëducation of an Aphasic," *J. of Phil., Psychol., &c.*, 1905, 2, 589-597.

The collection of negative cases which is here made might be added to, but sufficient are cited to show that the destruction of a part of the cerebrum which is followed by an obvious defect does not mean that that part of the cerebrum is solely concerned with that function. The facts show that even though there be an abolition of function there is a possibility of recovery, or, to state the matter in other terms, that the loss of a certain function because of cerebral destruction does not indicate that the individual has not the functional capacity, if suitable conditions of stimulation are provided. This means that the motor cortex is not necessary for the execution of a voluntary movement, that the visual cortex is not necessary for vision, that the tactile cortex is not necessary for tactile discrimination, and that the speech cortex is not necessary for speech functions.

When these facts are admitted, as they must be admitted, the whole structure of cerebral organology breaks down. The histological localization of function which has been in vogue takes its true place as a histological differentiation of an anatomical nature, without the functional implications which have been assumed. The facts also indicate the necessity for a careful reinvestigation of many of the parts of the cerebrum especially by methods of destruction, and by the utilization of our knowledge and by the methods of habit formation. What appears to be most probable is that there is much more variability in the functions of different brains than has been admitted, and that there are mechanisms for the performance of various operations which can be used in parts or as wholes. Some years ago Meltzer directed attention to what he called the "factor of safety in the animal economy," by pointing out certain facts which had long been known, such as the fact that an individual might be able to live with only one half of one kidney. In mechanical operations, such as bridge building, the factor of safety is from twenty-five to fifty per cent., the engineer making an extra allowance for possible extra loads or strains. In our physiological organs the factor of safety is much greater, as indicated in the example of the kidney, where the safety factor is nearly three hundred per cent. The factor of safety in the brain has not been duly considered, but it may well be that this factor is as great as in any of our other necessary bodily mechanisms. The results of reeducation indicate that there is some extra-cortical material which may be utilized when cortical parts are destroyed or are made functionally inoperative.

SHEPHERD IVORY FRANZ

GOVERNMENT HOSPITAL FOR THE INSANE

RARE RESEARCH MATERIAL

Recent scientific papers and other data personal and general have suggested to me that researchers, and especially those in the various psycho-biologic fields, should have at their command some agency by which unusual "material" of whatever sort might be made more fitly and more widely available for study. One thinks off-hand, for examples, of unusual blood-pressures; of accident-results perhaps never again to be duplicated, and of conditions of much interest, due to uncommon surgery; of multiple personalities; of cases of bradycardia; somnambulists; hysterics; aphasics; variously skilled persons; of cases of congenital double cataract, both before and after couching; uncommon visual phenomena of many kinds from the kinesthetically expert blindman to unilateral or mixed color-blindness; of internal-ear phenomena; hyperexpert sense-development such as that of smell in Helen Keller, etc.; of open skulls such as Shepard has so usefully employed; of uncommon idiots; of quite numberless varieties of abnormality proper in any scientific biologic direction so frequent in the medical journals and in the treatises on teratism, and so potentially and uniquely useful to science oftentimes, yet so entirely hidden from view and experimental use behind the thick veil of space and time and circumstance.

Therefore I suggest the establishment, by some adequate body, of a sort of *uncommercial registration-bureau*, coöperative in method, to which all and sundry advanced students of any phase of the science of life would habitually briefly report rare or otherwise especially useful research-material; learn where it might be employed; under what conditions; and so on, *pro re nata*.

This agency of scientific coöperation might be a very simple affair so far as business-system is concerned and therefore inexpensive to carry on, and yet be of quite surprising value in the furtherance of psychological, physiological, educational, and general institutional research.

And it is at least to me plain enough that one of the most formidable handicaps to present advance in psychology and in physiology and their congeners, is that the greater number of their devotees, often of the most progressive intelligence, fail to see how much each science has for the use of the other, and wholly ignore the often quite invaluable offerings which *derangements* and *abnormalities* of mind and body, make for comparison and study. It is quite as if a diseased mind or a sick or deformed body were a

geological phenomenon or anything else at all rather than usefully psychological or physiological in the realest sense. But this is only one aspect of the difficulty which the proposed uncommercial registration perhaps would help to solve.

Unusual, even unique, material, and that in great variety, would often prove to be readily available for employment in research, and frequently to the considerable advantage of each party concerned. In some cases loose academic relationship might be set up (like that of the uniquely skilled Blaschkas at Harvard, for example), or even after the now decadent manner by which football "stars" are given (temporary) location in some college constellation. The appreciation and recognition that rare natural phenomena often have great general research-value, is the main thing; the precise means by which they may be made practically available to the right experimenter and observer, would readily work itself out at opportunity.

GEORGE V. N. DEARBORN

CAMBRIDGE, MASSACHUSETTS

BOOKS RECEIVED

HALL, G. STANLEY. *Jesus, the Christ, in the Light of Psychology*. New York: Doubleday, Page, 1917. Pp. xix+733. 2 vols. \$7.50.

FORBES, W. E. *Cycles of Personal Belief*. Boston: Houghton, Mifflin, 1917. Pp. vi+149. \$1.25.

BJERRE, P. *The History and Practice of Psychoanalysis*. (Trans. by E. N. Burrow.) Boston: Badger, 1917. Pp. 294. \$3.00.

FERENCZI, S. *Contributions to Psycho-analysis*. (Trans. by E. Jones.) Boston: Badger, 1916. Pp. iv+288.

PETERS, W. *Ueber Vererbung Psychischer Fähigkeiten*. Leipzig: Teubner, 1916. Pp. 382. (*This is the book confiscated by the British Censor as contraband of war.*—ED.)

LAY, W. *Man's Unconscious Conflict*. New York: Dodd, Mead, 1917. Pp. 318. \$1.50.

NOTES AND NEWS

THE present number of the BULLETIN, dealing with physiological psychology, has been prepared under the editorial supervision of Professor R. P. Angier, of Yale University.

DR. A. H. SUTHERLAND, at present instructor in psychology at Yale University, has accepted a position as psychologist in the public school system of Los Angeles.

DR. C. E. FERREE, of Bryn Mawr College, has been promoted to a professorship in experimental psychology.

DR. GEORGE R. WELLS, associate professor of psychology in Oberlin College, has been appointed to a new professorship of psychology in the Ohio Wesleyan University, and will assume his duties in September. A psychological laboratory, housed in a separate building, has been provided and is being equipped at the latter institution.

THE University of Iowa plans to begin work on child welfare in the summer. The legislature of the state has appropriated \$25,000 a year for the work, which will include the investigation of methods of applying psychology to the development of the child.

At a special meeting of the Council of the American Psychological Association it was voted that committees be organized to deal with the relations of psychological methods and information to military activities. The committees with their chairmen are as follows:

(1) General psychological committee of the National Research Council. Chairman and member of the Research Council, Robert M. Yerkes, Harvard University.

(2) Committee on psychological literature relating to military affairs. Chairman, Madison Bentley, University of Illinois.

(3) Committee on the psychological examining of recruits. Chairman, Robert M. Yerkes, Harvard University.

(4) Committee on the selection of men for tasks requiring special skill. Chairman, E. L. Thorndike, Teachers College, Columbia University.

(5) Committee on psychological problems of aviation, including the examination of aviators. Chairman, H. E. Burt, Harvard University.

(6) Committee on psychological problems of incapacity, especially those of shock and re-education. Chairman, Shepherd Ivory Franz, Government Hospital for the Insane.

(7) Committee on the psychological aspects of vocational advice and training. Chairman, John B. Watson, Johns Hopkins University.

(8) Committee on recreation in the army and navy. Chairman, George A. Coe, Union Theological Seminary.

(9) Committee on pedagogical and psychological problems of military training and discipline. Chairman, Charles H. Judd, University of Chicago.

(10) Committee on problems of motivation in connection with military service. Chairman, Walter D. Scott, Northwestern University.

(11) Committee on problems of emotional stability, fear, self-control, etc. Chairman, Robert S. Woodworth, Columbia University.

(12) Committee on acoustic problems of military significance. Chairman, Carl E. Seashore, University of Iowa.

(13) Committee on visual problems of military importance. Chairman, Raymond Dodge, Wesleyan University.

The chairmen of these committees will welcome pertinent suggestions and offers of assistance in the different lines covered by the topics.

THE Southern Society for Philosophy and Psychology held its twelfth annual meeting on April 12th and 13th, 1917, at Randolph Macon Woman's College, Lynchburg, Va. It was voted to extend the scope of the Society so as to include "Experimental Education," and to hold the next meeting at Peabody College for Teachers, Nashville, Tenn. The following officers were elected: President, Prof. E. K. Strong, Jr., Peabody College, Nashville; Vice-President, Dr. T. V. Moore, Catholic University of America, Washington, D. C.; and Secretary-Treasurer, Prof. W. H. Chase, University of North Carolina. The newly elected members of the Council are: Dr. Tom A. Williams, Washington, D. C., Prof. E. B. Crooks, Randolph Macon, Lynchburg, Va., and Prof. Knight Dunlap of Johns Hopkins University.

PUBLISHERS' NOTICE

Owing to the greatly increased cost of production we are compelled to raise the price of our publications. Beginning July 1, 1917, the subscription to the REVIEW and BULLETIN will be \$6 and to the JOURNAL \$3.25, with other rates corresponding. The complete list will be found on the inside cover page.

PSYCHOLOGICAL REVIEW COMPANY

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THE

PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE TWELFTH ANNUAL MEETING
OF THE SOUTHERN SOCIETY FOR PHILOSOPHY AND
PSYCHOLOGY, LYNCHBURG, VIRGINIA, APRIL 12
AND 13, 1917

REPORT OF THE RETIRING SECRETARY, L. R. GEISSLER, CLARK
UNIVERSITY

The twelfth annual meeting of the Society was held at Randolph Macon Woman's College, Lynchburg, Virginia, Thursday and Friday, April 12 and 13, 1917. The afternoon session of the first day was followed by an automobile ride through the city and its beautiful surroundings provided most graciously by the Lynchburg Chamber of Commerce. In the evening of the same day a banquet was held at the Virginian Hotel which was followed by the president's address, entitled "Education for Democracy." An important business meeting preceded the afternoon session of the second day. In the evening the society joined with a gathering of physical directors of women's colleges and the faculty and student-body of the college to hear an address by Professor Knight Dunlap on "Criteria of Male and Female Beauty" and by Dr. R. S. Carroll of Asheville, N. C., on "The Reëducation of the Nervous," which was followed by a reception in honor of the two visiting organizations rendered by the president and faculty of the college. In every respect the meeting was most successful and clearly demonstrated the advisability of holding future meetings in the spring-time and at some southern institution of learning.

At the business meeting on Friday afternoon the following items were passed upon:

1. A cordial invitation from President Payne and Professor Strong, to hold the next annual meeting at the George Peabody College for Teachers, Nashville, Tenn., was gratefully accepted.

2. That part of the proposed amendment to the constitution referring to section 1, Article 1, and involving a change in the name of the organization was defeated; but the second part, referring to section 2 of Article 1 and adding the words "Experimental Education" to the scope of the society was adopted.

3. The following resolutions were unanimously adopted: (a) "Resolved that the president and faculty of Randolph Macon Woman's College and the Chamber of Commerce of the city of Lynchburg be asked to accept the sincerest appreciation of the Southern Society for Philosophy and Psychology for the cordial hospitality which they have extended us during our meetings at the college and our stay in the city." (b) "Resolved that the thanks of the Southern Society for Philosophy and Psychology be tendered to the retiring president and secretary for their earnest labor in arranging for the present meeting and building up the society during their term of office." (c) "Resolved that the members of the Southern Society for Philosophy and Psychology assembled at Lynchburg, Virginia, assure the President of the United States of their loyal support in the present national emergency."

4. The following officers were elected: President, Professor E. K. Strong, Jr., Nashville, Tenn.; Vice-president, Dr. T. V. Moore, Washington, D. C.; Secretary-Treasurer, Professor W. H. Chase, Chapel Hill, N. C.; member of the Council for two years, in place of Dr. E. E. Rall, resigned, Dr. Tom A. Williams, Washington, D. C.; members for three years, Professors E. B. Crooks, Lynchburg, Va., and Knight Dunlap, Baltimore, Md.

5. The following were elected to membership: Prof. A. G. A. Balz, University of Virginia; Miss Ethel Bowman, Clark University; Mr. T. W. Brockbank, Catholic University of America; Brother Antoninus, C.F.X., Catholic University of America; Prof. A. S. Edwards, University of Georgia; Prof. S. C. Garrison, Durham, N. C.; Prof. Thomas R. Garth, Richmond, Va.; Prof. Alfred L. Hall-Quest, University of Virginia; Prof. Wm. H. Heck, University of Virginia; Prof. J. A. Highsmith, State Normal College, Greensboro, N. C.; Prof. J. H. Johnston, University of North Carolina; Miss Grace Lyman, Woman's College of Alabama, Montgomery, Ala.; Prof. Charles G. Maphis, University of Virginia; Prof. Wilbur H. Norcross, Dickinson College, Carlisle, Pa.; Mr. Wm. R. Smithey, University of Wisconsin; and Prof. H. D. Williams, Brenau College, Gainesville, Ga.; and Prof. L. A. Williams, University of North Carolina.

6. The accounts of the retiring Treasurer were audited by a Committee and showed a balance on hand, April 13, 1917, of \$93.69.

L. R. GEISSLER,
Secretary-Treasurer

WORCESTER, MASS.

TITLES AND ABSTRACTS OF PAPERS

Education for Democracy. D. S. HILL, University of Wisconsin.

The Significance of Beauty. KNIGHT DUNLAP, Johns Hopkins University.

Beauty in the human individual is taken from the realm of the ornamental and shown to be something which is vital for the welfare and progress of the race. The individual and racial characters which enter into the complex of beauty are discriminated and the particular significance of the several individual factors pointed out. Finally, the interrelation of these factors and their reference to the paramount potentiality of the individual is shown.

The Nature of Mental Functions. L. R. GEISSLER, Clark University.

The main conclusions of this paper may be summarized under the following five heads: (1) The distinction between mental structure and mental function is due to two different ways of looking at the same experience or mental phenomenon, in one case describing the number, nature, attributes, quantitative laws and limits, and the changes involved in mental processes considered as separate existences, in the other case designating relations occurring among them or between them and non-mental phenomena or else indicating mental activities by an emphasis upon the results accomplished through the structural changes. (2) One of the important problems of a systematic functional psychology is to work out experimental methods and a consistent terminology for the study of mental functions, activities, and relations, and to determine to what extent introspection from a functional standpoint is possible and adequate. (3) Introspection functionally applied seems perfectly adequate for the designation of intrinsic mental relations, but in the case of extrinsic relations and of mental activities it must be supplemented by other methods. (4) For the sake of greater psychological accuracy in introspection it is desirable to adhere strictly either to the one or to the other point of view for a time

being, and not to combine the two, in order to avoid confusions and conflicts such as seem to have resulted from a combination of the two standpoints in the case of imageless thought, relational elements, and the distinction of act and content. (5) A change in standpoint involves, psychologically considered, a change in attitude and in task, which set up a given set of determining tendencies in accordance with which different aspects of the same phenomenon under observation are temporarily disregarded while others are similarly emphasized.

Perception as a Function of Time and Quantity to be Perceived.

BROTHER ANTONINUS, C.F.X., Catholic University of America.

It is stated that only a few impressions—four to six printed letters—can be grasped in a single act of perception. But even with a short exposure, one cannot exclude the possibility that the judgment is based upon the subject's memory of the stimulus and so does not really afford us any information about the "span" of consciousness.

I undertook the following experiment for the purpose of determining the relation of the time of perception to amount perceived: Dots, from one to ten, were arranged in haphazard order, within the area of a two-centimeter circle, on cards. At the instant of exposure the chronoscope was started. When the subject was certain of the number of dots exposed he pronounced the name of that number and so stopped the chronoscope. In order to prevent the subject from becoming familiar with the groupings, thirty cards for each number of dots were prepared. After the first presentation the cards were inverted, thus giving a new arrangement to the dots. The average time of perception was then calculated. This time I shall call the time of perception and naming. A second experiment was performed, in which the subject reacted to printed numbers in order to the time required for simply naming the numbers. This time was subtracted from the time for perception and naming, giving the time of perception.

A number of interfering factors disturb the simple process of perception above six. The larger numbers are broken up into groups and some difficulty is experienced by subjects in attempting to keep these groups apart; and, some combinations are very perplexing and there is a tendency to guess rather than to actually perceive the number of dots.

T. B. Robertson gives a formula for auto-catalytic reaction,

which he states may be applied to mental phenomena and the curve of memory has already been found to follow this law. At first I applied to the curve of perception Robertson's formula, which does not apply to the results obtained, but, if the variables are interchanged the curve of the new formula approximates the observed curve of perception. This seems to indicate that perception can be given a physiological basis. At any rate, it is worthy of note, that two things, psychologically opposites, follow the same law when the variables are reversed.

A Southern Philosopher. E. B. CROOKS, Randolph Macon Woman's College.

Albert Taylor Bledsoe, born in Kentucky, 1809, graduated at West Point, was by turns soldier, clergyman, lawyer, professor of mathematics in the Universities of Mississippi and Virginia, assistant secretary of war in the cabinet of Davis, writer of books and editor of *The Southern Review*. He died 1877.

The following are the philosophical works of Bledsoe: "An Examination of Edward's Inquiry into Freedom," 1845; "A Theodicy, of Vindication of the Divine Glory," 1853; "The Christian Cosmos," an incomplete work published in *The Southern Review* in 1878; "The Philosophy of Mathematics," 1868.

I have been unable to secure the last-named work. The first three of these books are really a progressive series. The books on "Edwards" and "The Theodicy" argue for the freedom of man in the moral world, while *The Christian Cosmos* attempts to explain the presence of evil in the natural world. Bledsoe's attack is principally directed against those necessitarians who at the same time assert determinism and the moral responsibility of man.

Bledsoe examines the systems of the principal determinists from Descartes to McCosh and his analysis and criticisms of their positions is most searching and acute. But when he comes to his own constructive doctrine of freedom he is neither complete nor very convincing. He acknowledges, with M. Cousin, that the reflective reason in its judgments and the "sensibility" in its perceptions and feelings are under the law of necessity, but, he claims, the mind is free when it acts, namely, in its volitions. This is true because the attitude of the mind when it acts is entirely different from its conscious passivity in reflection, perception and feeling. The mind is not indeed conscious of a "power" to act or not act, but it is conscious of its act as its own. His treatment of this

problem reminds one of Eucken's activism and also of Bergson's "élan vital."

Bledsoe thought he was a voluntarist but really his method is, as a whole, thoroughly rationalistic. He is a significant thinker when taken in connection with the intellectual movement of which he was a part. Whenever Edwards is read, if he is yet read at all, Bledsoe should be read also. And in any case Bledsoe deserves a place in any history of American thinkers.

The Psychology of the Origin of Devil-Ideas. W. T. SHEPHERD, Washington, D. C.

The writer criticizes Sparkman's psychological attempt to explain the origin of ideas of Satan by the Freudian method. He objects that devils are *never desired* by man, and so much ideas could not be "the output in a sublimated manifestation of various thwarted and suppressed wishes of which it is no longer conscious." However, it is conceivable that ideas of *beneficent spirits* might be in part accounted for by the Sparkman view.

From a study of ideas of devils, as held by many peoples, in many typical religions, the writer concludes that the following are the important factors in their genesis: (1) imagination; (2) credulity; (3) fear; (4) curiosity; (5) personification of evil; (6) the subjective element in man; (7) abnormal mental phenomena, epilepsy, etc.; (8) unusual and awful natural phenomena; (9) environmental conditions; (10) the doctrine of immortality.

Methods and Problems in the Measurement of Association Reactions. KNIGHT DUNLAP, Johns Hopkins University.

This is a report on work done by Dr. Loring with the association apparatus which has been developed in the Johns Hopkins laboratory and described elsewhere. After making from the Student's Standard Dictionary a list of 10,888 words, including all nouns, adjectives and verbs which could possibly be used in an association experiment, the list was further reduced by preliminary work on several subjects to approximately 8,000. Lists for several controls were made from these and carried through on a number of subjects, giving important results on the relative reaction times for the several controls. A new type of double control was also developed which may serve for diagnostic purposes. A number of vital problems were formulated in the course of the work.

Retention in the White Rat. T. W. BROCKBANK, Catholic University of America.

The paper served to present the course of some preliminary steps to a broader and more conclusive work which the author is attempting in the subject, as well as to make some general definitions which seem necessary in view of existing confusion in the field of Retention.

It was pointed out that experiment up to the present, seems to indicate that the length of period of disuse of a habit has a marked effect on Retention; that the distribution of effort in Retention seems to follow the facts as established in the distribution of effort in learning; and that there is a dominant recurrence in Retention trials of those errors which are made most frequently in learning. This last fact is most evident after the longer periods of disuse, when the trials in Retention show a greater number of errors which appeared also in the learning.

Sound Discrimination in Dogs. W. T. SHEPHERD, Washington, D.C.

The paper is a report of experiments which were made on two dogs to ascertain their ability to discriminate differences of musical notes of different pitch. If an animal forms an association between a certain musical note and food, so that he reacts in a definite manner to that note in order to obtain food, we may infer that he discriminates that note from the other notes. The animal was to rear up with its fore paws on the front of the cage and look at experimenter at the sound of the proper note, and not so to react upon the sounding of the other notes.

Results: One (the younger animal) learned to react to food note and so manifest discrimination of a difference of three octaves of pitch on an harmonica in twenty-three days of tests, or in 385 trials in all. She also showed discrimination of difference of pitch on an organ in 115 trials (made in seven days, and following former tests). The other dog failed to show satisfactory evidence of discrimination in 450 trials with harmonica.

Securing Information Concerning College Students for the Appointment Committee. E. K. STRONG, JR., Peabody College for Teachers.

In order to fit graduates into appropriate positions, the appointment committee of a college must have as complete information as possible as to the applicants' fitness. Such information, as

secured now-a-days, can be roughly classified under three heads: (1) that based on intelligence tests, (2) that based on scholarship grades, and (3) that based on faculty rating. A fourth source not available in advising students, but necessary in order to check up any careful study of the subject is the value of the position the student actually secures.

At the present moment appointments are made more largely on the basis of faculty opinion than on any other criterion. But there exists no adequate means of combining the opinion of several individuals into an average which has as definite a meaning as the individual ratings. In order to help solve the difficulty a scale of general intelligence of students at George Peabody College has been developed along the lines of Thorndike's Handwriting scale. A preliminary trial of the scale has shown that all the members of the faculty felt that the scale was valuable and that they could easily and fairly accurately grade new students in terms of the scale made up of old students.

The correlations so far worked out suggest that the four sources of information concerning a student are related to each other in the following order: (1) mental tests, (2) grades, (3) faculty opinion, and (4) value of position. That is, (1) correlates highest with (2), next highest with (3), and low with (4); (2) correlates higher with (1) and (3) than with (4), etc. It is suggested that intellectual ability (what a student may do, but not necessarily what he will do) is emphasized less and less as you go from (1) to (4), and that "emotional drive," "determination," or the slang "pep," together with "personality" are taken into consideration more and more as one goes from (1) to (4). If these considerations are correct, it would seem that appointments based on a combined faculty opinion rating would be of more value for the appointment committee than ratings based on intelligence tests alone. Probably a skilful fusion of the first three would be still more reliable.

Yerkes Point Scale for Measuring Mental Ability as Applied to Normal Adults. S. C. GARRISON, Durham, N. C.

During the spring of 1916 the Yerkes Point Scale test was given to 88 students in the psychological department of George Peabody College for Teachers. The class standing of the students ranged all the way from freshmen to second-year graduate students and their ages from 18 to 45 years. None of the students were familiar with the test and only a few had any knowledge of the Binet-Simon

test. The instructions set forth by Yerkes were strictly followed. All the subjects, except one, showed a willingness to act as subject. In this test it is possible for the subject to make a score of 100 points. The average score for the whole Peabody group is 96.5 points. Yerkes (*A Point Scale for Measuring Mental Ability*, page 92) found the average to be 94.6 for 25 students in the Boston Y. M. C. A. He also found an average of 88.3 points for 25 adult mill operatives. Very little difference was found in the average results of the 20 tests, into which the Point Scale test is divided, secured from the Peabody students and the Y. M. C. A. students.

In order to find whether there was any relation between the Point Scale results and class grades, the grades of all the Peabody students were secured for the quarter during which the test was given. A combined ranking was secured from these. Also a ranking based upon ratings of the students by 8 members of the faculty was secured. These two rankings were then correlated with the Point Scale ranking and with each other with the following results: for the Point Scale and grade rankings a coefficient of correlation of 0.19 was secured; for the faculty and Point Scale rankings one of 0.15; and for the faculty and grade rankings one of 0.59. After securing such low coefficients of correlation when the Point Scale ranking was used, we discarded all the individuals who had made a score of over 96. This left about 50 per cent. of our cases. These were in turn correlated with the faculty and grade rankings. The following coefficients of correlation were then secured: faculty ranking and Point Scale 0.11; Point Scale and class grade 0.21; faculty ranking and class grade 0.70.

The tests seem to be too easy and the coefficients of correlation seem to show that there is very little, if indeed any, relation between the rankings given by the Point Scale test, the school grades, and the faculty ratings.

The Learning Curve as a Diagnostic Measure of Intelligence. E. K. STRONG, JR., Peabody College for Teachers.

The slope of learning curves of school children based on simple arithmetical combinations apparently correlates to a very considerable extent with the general intelligence of the children. This is particularly true when the extreme cases are alone considered. Very steep curves or very flat curves are accompanied by decidedly good or poor work in the grades.

Fourth grade normal children advanced in 14 days drill of two

minutes each day from 38 simple addition combinations, such as
9 3
4 or 7 in two minutes to 66 such combinations. A class of defective children of the same age but in still the second grade advanced from seven to fourteen such problems. After 25 days of special drill on the material by a good teacher, the class advanced from 15 to 22 problems. (It is only fair to say that a considerable part of the gain is due to two or three children whose presence in the special class was due to sickness, etc., rather than mental defectiveness.) It is suggested that some drill work in the early grades can be carried on in such a way that learning curves of the children can be developed. In terms of these curves very much information as to the real ability of the children can be obtained. Class-subdivisions, etc., could properly be based on the slope of the learning curves.

Experimental Studies of Achievements in Spelling, Reading and Arithmetic, of Large Groups of Children in the South and Certain Related Problems. DAVID SPENCE HILL, The University of Wisconsin.

1. *Spelling Tests of 24,384 Children in 78 Schools.*
2. *Measurements of Achievements in Silent Reading.*
3. *Arithmetic Abilities of 15,000 Children Measured by Courtis Tests, Series B, I.*

These three studies were made under the direction of the writer in the spring of 1916 and during the term of his contract in New Orleans. The children were approximately 25,000 pupils of the public schools. For local use typewritten memoranda of the results were distributed to teachers and principals. Partial results of the researches of the year were included in a recent annual report of the board of school directors of New Orleans. An adequate presentation of the data and analysis, it is hoped, will be published elsewhere. In the present three series of tests emphasis was placed upon: (a) Organization of work of administration of the tests and of computation by trained assistants in order to secure validity. (b) Getting results promptly to teachers, citizens and pupils. (c) In the case of spelling, upon the introduction of standard illustrative sentences, a factor overlooked in the Butte, Springfield, Des Moines and Oakland studies. For use of investigators the writer will furnish the sentences and words (address University of Wisconsin). (d) Certain discrepancies were detected between the actual lists

used widely in Butte, Springfield, etc., and Ayres's elementary vocabulary as printed. (e) explanations to principals of the limitations and of the wise administrative uses of results. (f) It was observed that the inferiority of the scores made by the negroes, as a rule in spelling, reading, and arithmetic, cannot safely be made the basis of deductions concerning psychological differences of race, owing to the markedly different social and economic factors, and the characteristics of the schools, affecting respectively the groups of whites and blacks. (g) The use of all the above tests were chiefly pragmatic. It seems obvious that complete psychological analyses are demanded in order to determine what is actually measured by the devices used—Ayres's, Kelly's, Starch's and Courtis's.

The Concept of the Subconscious. H. W. CHASE, University of North Carolina.

The results of much physiological research during the last few years have been such as to make it evident that the traditional formulæ in which the psychologist has set forth his ideas of the physiological bases of mental activities are far too simple. The work of Sherrington, Cannon, and others, leads to the conclusion that much, if not most, of the nervous system, including both central and autonomic divisions, is active at any given time and that much of this activity is typically integrated to produce a single end-response. This means that the cortical processes directly correlated with a given mental state are only the focal points of the activity of many complex neural patterns. The particular cortical pattern connected with the given state of consciousness is conditioned by the total activity of the nervous system at the time. The Freudian analyses are valuable for the stress which they lay on this fact of the intricate determination of every mental state. This is true whether or not the conclusions reached by their methods in any given case be accepted. The Freudians, however, have been driven to mysticism by their attempt to demonstrate that this determination is psychic rather than physiological. It is to be interpreted, as Watson is insisting, in terms of neural mechanisms.

The activities of cortical mechanisms which condition the conscious response, but are not themselves accompanied by mental states, may be regarded as subconscious. In abnormal conditions such mechanisms may so integrate themselves as to produce behavior not characterized by the presence of conscious states. Whether this is possible in normal conditions is a question needing

experimental investigation. The idea of the subconscious as an entity must be abandoned, as that of consciousness as an entity is in process of abandonment. Subconscious processes there are, but merely in the sense of complex neural activities not accompanied by mental states. Such a point of view is not new, but the beginnings of serious attempts to understand human behavior make it necessary that the recognition of their presence be more than through the perfunctory statement that determining tendencies, nervous sets, etc., exist. The psychologist must learn from the student of abnormal mental phenomena the importance of subconscious processes, and must strive to extend experimental methods to this field.

Some Aspects of the Relations of Abnormal Psychology to Educational Problems. LUCILE DOOLEY, Washington, D. C.

Since abnormal psychology investigates, analyzes, and describes defective, inadequate or disorganized modes of behavior its relation to educational problems must be one deserving serious consideration by educators whose function it is to build character that is socially useful. The problem of the "defective" child has received much attention from both psychologists and educators, and the space given to mental tests for the determination of retardation or intelligence defects now bulks large. A yet more important problem of education is the problem of the *prevention* of defective development. That social inefficiency may be prevented in many cases by carefully directed education of the unfortunately placed individual is a warrantable conclusion to be drawn from the successful reëducation and rehabilitation of adult derelicts by psychiatrists who use the method of psychoanalysis or other methods. Students of abnormal psychology in the field especially of the emotions have been able to show where faulty adjustments or vicious reactions at certain points have resulted in mal-development that could have been avoided by intelligent guidance at the important time. Pawlow's demonstration of the conditioned reflex and Freud's theory of the repressed complex, and his valuable principle of the transference of affect to successive objects, are not far apart in the light they throw upon a crying need in education and a problem that cannot be ignored, namely, the training of the emotional nature of the child. This necessarily throws the emphasis of our educational theory upon the individual. The need can not be met by the insufficient number of insufficiently trained teachers now at our com-

mand. This is no reason, however, why the problem should not be faced, studied, and progressively solved as we grow in wealth and wisdom. We have made a beginning at such special care of the feeble-minded and in efforts at vocational guidance and training.

Abnormal Psychology, in its analysis of intelligence and character defects of individuals, influences the solution of educational problems along lines that may be roughly indicated as follows: (1) The problem of the special care and training of the congenital defective as to make him of as little detriment and of as much positive benefit to society, as possible. (2) The problem of special training of the "socially feeble," as distinguished from the intellectually feeble. (3) The problem of vocational selection as a problem of social efficiency. (4) The problem of obtaining the maximum development and efficiency in every individual.

The Conservation of Mental Health. TOM A. WILLIAMS, Washington, D. C.

This matter is of national importance, as is shown in the character of such peoples as the French, the Poles, Russians, Germans, in the conduct of their affairs. The fundamental bodily factors of mental health are not entered into in this place.

The psychological factors, dynamic influences determining static potentialities, are controllable environmentally, especially during formation in youth. The tendencies of a child may be fostered, deviated or repressed. To ascertain which are the desirable trends is the task of the psycho-diagnostician. Every parent should consult one regarding the children's traits. The fostering of these then becomes an aim to be intelligently pursued. It is in this way that precocity has been attained by some in our day. Undesirable tendencies are readily deconditioned into health by causing their opposites to appear attractive through a method of psychological substitution effecting a change of inclination. Repression, the aim of most moralists, is a dangerous and seldom successful procedure.

The psychology of two chief types of individuals, the impulsive and the anxious, is considered. Sometimes innate, each of these characters can often be traced to psychological determinants. The maladaptability of such individuals is obviated by psychotherapy. When this is skilful, adjustment persists. Proper psychorthogenetic procedures are powerfully prophylactic, both against hysterizability and against potential psychasthenia. Adults already

possessing these tendencies must be taught their own psychology by the mental conservator, who must be a physician as well as a psychologist, in order to differentiate in each patient the manifestations which arise from those disturbances of the body which are not psychogenetic. Only a very thorough knowledge of the practical application of physiology, medicine and clinical neurology can compass the delicate differentiations often required.

The Psychology of Inebriates. TOM A. WILLIAMS, Washington, D. C.

Inebriety is merely the expression of craving, due to inadequacy, vacuity, or suffering of various causations. Physical factors are very important as well as the psychological. The latter are usually the product of upbringing. The chief of these are discussed with reference to different types of inebriates.

Correlation between Memory and Perception in the Presence of Diffused Cortical Degeneration. THOMAS VERNER MOORE, Catholic University of America.

Correlations were based on memory and perception measurements made on thirty inmates of the institution at Egelfin and Haar near Munich. Patients were suffering from paresis, Korsakow's psychosis, chronic alcoholism or dementia senilis. It was maintained that in the study of the correlation between mental functions there is a certain advantage in choosing pathological cases. The wide distribution of values renders the correlation less likely to be swamped by the errors of observation. Measurements were made by exposing to the patients in successive experiments eight real objects, eight pictures, eight printed words and eight spoken words.

Two measures of memory were obtained: (a) The number of objects, pictures, and words recalled immediately; (b) the ratio of what was remembered after one minute to the value obtained for immediate memory. Perception was measured by having the patient name pictures of simple objects and measuring by means of a stop watch the time it took them to do so, and recording the number of pictures they succeeded in interpreting. Assuming that perception varies directly as the percentage interpreted and inversely as the time of naming one obtains a quotient which is a fair index of the ability to perceive. Correlation between perception and memory ratio is $.65 + .07$ thus showing that both functions have some tendency to deteriorate with general cortical involvement.

A table of correlations was constructed and the correlation of correlations determined as suggested by Hart and Spearman. Applying their criterion one does not find evidence only of general ability but rather that two such things so closely connected as immediate memory and the rate of forgetting must depend on two different functions of the nervous system.

The Effects of Habits in the Responses of the White Rat. JOHN L. ULRICH, Catholic University of America.

The Influence of Pauses in the Economy of Learning. H. D. WILLIAMS, Brenau College.

A Note on Consciousness. WALTER B. SWIFT, Boston, Mass.

Conflicting Affective Reactions to Compound Visual Stimuli and Their Influence on Behavior. E. J. KEMPF, St. Elizabeths Hospital.

Reëducation of the Nervous. R. S. CARROLL, Asheville, N. C.

GENERAL REVIEWS AND SUMMARIES

HEARING

BY ROBERT MORRIS OGDEN

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Our understanding of the physiology of the inner ear is augmented by Hardesty's careful investigation of the organ with special reference to the structure and growth of the tectorial membrane (3). Studying chiefly the organs of hogs, as prepared immediately after slaughter, the author is able to demonstrate that the tectorial membrane is continuous throughout the cochlear duct, and that it varies uniformly in width, thickness and volume. It is about seven times wider at the apical than at the basal end of the cochlea, whereas the corresponding variation of the spiral lamina is only about 1 to 1.4. In thickness its variation is about 1 to 3, and in volume 1 to 41.7. The specific gravity of the membrane is but little greater than that of the lymph which surrounds it, consequently it is not subject to any considerable shifting of position when the head is moved. From these results the author concludes that the tectorial membrane is the chief vibratory structure in the mechanics of hearing. The basilar membrane may

participate in the case of very strong sound, but its fibers are so blanketed that they cannot, he thinks, be subject to independent vibration. He therefore favors a "telephone" theory as against the Helmholtzian conception. Although the details of a complete theory are not given, it would appear that tones of different pitch are stimulated at different regions of the cochlea in accordance with the varying vibratory capacity of the tectorial membrane. Stefanini (8) constructed a model similar to those of Ewald and Lehmann, in which, however, the rubber membrane was replaced by one of waxed cloth stretched in the form of a piano board. He found that despite the longitudinal cross-fibers of the cloth, the horizontally stretched fibers reflected by appropriate mirrors at different regions vibrations that corresponded to different sound pitches produced by tuning forks in their neighborhood. This he regards to be an important support for the Helmholtz theory, and it would seem to throw doubt on Hardesty's conclusion that the fibers of the basilar membrane are so "blanketed" that they could not possibly respond as resonators for sounds of varied pitch.

Sterzinger (9) has obtained interesting results concerning the general rhythmic effects of successive sounds, and their correlation with the agreeableness of the intervals employed. With a specially constructed chime whose tones varied in vibration frequency from 256 to 512 vib., he was able to study successive clangs with reference to their rhythm and agreeableness. The tones were actuated electrically at intervals controlled by the Meumann time-sense apparatus. The intervals studied were the major second, major third, fourth, fifth, major sixth, major seventh and octave. The results indicate that with successions of two or three tones of equal time interval and intensity, the higher tone carries the accent. The time interval between tones influences the subjective rhythm. A "neutral" interval was found to approximate .55 second. Shorter intervals favor iambic and longer intervals trochaic or spondaic rhythm. With three tones the rhythmic impression can be destroyed by gradually lengthening the interval between the end tone and its neighbor. Before the rhythm is destroyed there occurs a zone of doubt whose middle point is fixed as the "indifference point." In a three-tone succession a "natural pause" is required between the accent carrying end tone and its neighbor. The rhythmic character of a single interval was found to be the same whether it were a two-tone or part of a three-tone succession. A marked correlation appeared between the rhythmic character of

the intervals and their relative agreeableness. The curves as plotted rise from the major second to the major third, then to the fourth. They drop with the fifth, rise again slightly with the major sixth, drop again with the major seventh and rise finally with the octave. The curve of agreeableness with simultaneous binary combinations was found similar except that the highest degree in successive intervals was attained with the major third, and in simultaneous intervals with the fourth.

Weiss (12, 13) has constructed an apparatus for the production of pure tones in which the tones may be varied in intensity by any number of steps. The tones "come in" and "go out" at full intensity, without disturbing noises, and their phase relations are under control. In the experiments performed the tones used were those of 150, 200, 250 and 300 vibrations. Comparisons of two tones were thus made in which the tones were given simultaneously and successively, with one constant and the other varying its objective intensity through an arbitrary range of ten steps from a weak yet clear tone to a strong yet not disagreeable tone. The variations of intensity were of ascending and descending orders. The problem was to equate the intensity of the variable to that of the constant tone. The results indicate that a simultaneous tone is made weaker (or heard stronger) than a successive tone, and that a tone descending in intensity is made stronger (or heard weaker) than an ascending tone. In tones varying from weak to strong the observer left the tone too weak, whereas in tones varying from strong to weak he left them too strong. In the judgment of a simultaneous tone it is made about a half step weaker than is a successive tone. The successive tone intensities were less variable than the simultaneous, and the ascending series were less variable than the descending. The author estimates that at least twenty-five differences in tonal intensity might be discriminated. The variability of judgment was found to be less with intervals of 100 vibrations than with those of 50 or 150 vibrations. Birnbaum (1) describes an apparatus for testing auditory acuity. It involves a telephone tone made pure by the aid of a special disk and resonator, and permits exact variations of intensity by corresponding variations of an alternating current of electricity. Seashore (7) has given a popular description of his tonoscope and its range of usefulness as a means of practical training in singing, and as an instrument of scientific investigation.

Stumpf (10) in a critical review of the recent literature of hearing

accepts the distinction of *quality* and *pitch* or *brightness*. He is inclined to regard the former as a primary characteristic or common quality of all C's, D's, etc. These are referred to as "Urqualitäten," whereas the remaining musical intervals may be historically explained. With regard to the C's, Stumpf favors an outstanding place for them in the series of tones. These special C regions would account for Köhler's results which attribute to them the locus of the vowels. While recognizing the upward trend of the series *u*, *o*, *a*, *e*, *i*, and a region of brightness or pitch as characteristic of each, Stumpf is sceptical of the "octave law," and finds it impossible to discover a specific resemblance of *o*, *a* and *e* to c^2 , c^3 and c^4 . He is therefore inclined to reduce vocality to quality, rather than quality to vocality. Jaensch is criticized for describing vowels as the qualities of noise, and the idea is expressed that quality is a central factor, whereas pitch is determined by the receptor. The author further indicates his agreement with Brentano that discrimination of quality may be finer than discrimination of pitch.

The Pannenburgs (5) give their deductions concerning traits of character among musical persons as based upon three sources of information: (1) an elaborate questionnaire on heredity, (2) biographical data found in the lives of famous musicians, and (3) a school questionnaire. From the first material 423 persons of special musical talent, 52 possessing it in an exceptional degree, were taken into account. The second was based upon twenty-one monographic accounts of the lives of an equal number of famous musicians. The third dealt with results obtained from 342 boys and 152 girls between twelve and eighteen years of age, all of whom were musical. Correspondences in thirty-two traits were found between the first and second sources of information. From this a picture of the musical person is drawn with special reference to the characteristics of movement and manipulation, feeling, "secondary functions" such as shifting attention, intellect, desire, etc. It cannot be said that the correlations were always high, or that the resulting picture is altogether significant.

Peterson's observations on binaural beats (6) lead him to conclude that they are not explained by conduction of the sound waves *via* the bones of the skull. Binaural beats are distinct both in character and in physical cause from monaural beats. When the phenomenon is purely binaural, they are not beats at all, but periodically perceived changes in a tone whose location wanders or shifts from ear to ear. As these shiftings become rapid the effect

approaches that of true monaural beats, for the fluctuations can be counted with the same precision. The phenomenon appears to be of cortical origin. Burt (2) describes experiments in audition suggested by those of Wertheimer and Korte on a visual illusion of movement, and of Benussi on a tactual illusion of the same order. He finds that two faint similar auditory stimuli in quick succession a few centimeters apart yield, under certain conditions, the impression of a sound moving in the direction of the actual temporal succession. Although subject to a variable individual susceptibility, the phenomenon was noted by four of his five observers at an optimal time interval of 25 to 30 sigma. It was also found that the longer the exposure, the shorter, relatively, must be the time interval in order to yield the optimal impression of movement. Furthermore, if the intensity of the second stimulus was greater than that of the first, the apparent movement was often in the reverse direction. It is concluded that this illusion is so directly comparable in its conditions and effects to the illusions described by Wertheimer, Korte and Benussi that it suggests a similar explanation. Wertheimer's theory of a "physiologische Kurzschluss" between the regions of the cortex corresponding to the two points in visual space will evidently not apply to the auditory illusion. The author ventures an explanation in terms of the "action theory." Assuming a motor impulse to move the head, the positions of the sounds will be represented cortically by impulses of different intensity in the motor regions which lead to the muscles of the eyes and neck. If the second stimulus supervenes rapidly enough there is a continuity of motor impulse. The direction in which the second would lead, if executed, relative to the first becomes the cue to the direction of motion. With an increase in the intensity of the second, its motor impulse is temporarily facilitated sufficiently to produce the effect which would have been obtained had it actually preceded the first.

Two new volumes which warrant more detailed consideration than this summary will permit are *The Science of Musical Sounds* by D. C. Miller (4), and *The Psychology of Sound* by H. J. Watt (11). These are accordingly reserved for special reviews.

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AFFECTIVE PHENOMENA—EXPERIMENTAL

BY JOHN F. SHEPARD

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No very elaborate investigation has appeared during the year. Foster and Roese (3) gave their subjects definite experiences supposed to be typical of the six quality-groups of the Wundtian theory of feeling. This method, rather than a mere verbal statement, was employed to give the subjects correct standards of the quality-groups. After the orienting experiences for each quality-group, twenty-four tones were used in the paired comparison arrangement and the observer was asked to judge the tones with respect to the quality-group concerned. Curves were plotted showing the distribution of judgments. The writers maintain that they find six typical curves (three pairs) in their results; to the reviewer there seem to be enough exceptions to suggest almost every other curve which would be possible under the conditions. In any case, the three types of curves do not correlate with the Wundtian dimensions and the writers have not succeeded in correlating them with any other determining factors. The introspective reports are no more favorable to Wundt's theory. "Sense-feelings" as well as affections seemed to form the basis of judgments.

Moore (4) suggests a method for testing the strength of instincts or emotions which, if it can be made to work successfully, is of unusual interest. As in controlled associations generally, the subject is given a series of words to which he is to respond with a verb expressing reaction in which he is thought of as involved personally. Such reactions are then called for in response to words strongly suggestive of instinctive or emotional situations. If, for a given word, a different emotion than the one ordinarily expected is aroused, the one aroused is given the credit, the other graded zero for that particular test. The time is taken and is usually inversely proportional to the strength of the emotional effect. The interpretation to be made is checked by careful introspections. On the basis of a series of such records, it is hoped to grade an individual as to the strength of emotional responses.

In Feleky's (2) experiments, the subjects were asked to revive or imagine different emotional attitudes while the breathing was being recorded along with the time. The results seem to be very few, and indicate specific differences in the inspiration-expiration ratio, the depth of breathing, and the rate of work in breathing, correlating with specific emotional conditions. The difference between anger and hatred appears ambiguous.

Baxter, Yamada, and Washburn (1) gave sixty-nine observers a series of words, to half of which they were asked to respond with unpleasant personal experiences which the words suggested, to half of which they were to respond similarly with pleasant experiences. There seems to be some correlation between cheerful temperament and relative slow recall of the unpleasant. Recall of pleasant experiences occurred slightly more readily than recall of unpleasant experiences.

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AFFECTIVE PHENOMENA—DESCRIPTIVE AND
THEORETICAL

BY H. N. GARDINER

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If the somewhat acrimonious dispute between McDougall and Shand (6), in which Stout plays the part of a mediator, concerned only their personal differences of opinion, it might be dismissed with a brief reference; in point of fact it goes to the root of some fundamental questions and is perhaps the most important item in this year's report. The discussion is difficult to follow, being complicated by the effort on the part of each to convict the other of absurdities and inconsistencies, and the questions at issue are not always altogether clear. The basis of the discussion is a difference in the conception of instinct. According to McDougall an instinct is an innate affective disposition ("affective" for him includes "conative") of essentially the same nature as all other innate dispositions to feeling and action, its peculiarity consisting in "the innate conjunction of any such affective disposition with one or more cognitive dispositions." The differentia of instinct, then, consists in the existence of certain psychical dispositions with—it is to be assumed—their nervous correlates. Shand, on the other hand, regards it as consisting rather in modes of behavior, namely in complex trains of innately predisposed movements, and also in the simpler and the simplest constituents of such trains. Stout thinks that in including the last he is fairly exposed to McDougall's charge of obscuring the distinction between instinct and reflex action, and himself proposes to evade the difficulty by calling these constituent movements instinctive movements, but not instincts. Connected with this initial difference is that concerning the psychic aspects and relations of instinct. Stout objects to McDougall's definition as including without warrant a conative-affective disposition and a cognitive disposition as two separate structural units. The chief disagreement between McDougall and Shand concerns the relations of instinct and emotion. McDougall holds that the activity of an instinct is accompanied in all cases by an emotion that specially belongs to it, and on this basis founds his doctrine of primary emotions; Shand maintains that a primary emotion may employ different instincts, that the same instinct may subserve the ends of different emotions, and that an in-

instinct may be excited without evoking any particular emotion. McDougall, however, does not deny that variable emotional states arise in successive phases of the same activity; he only holds, as Stout points out, that there is one kind, and only one, which is *congenitally* determined. The question, then, is—and this seems at times to be the vital issue—whether the various emotions that occur in the course of an instinctive activity have their source, as Shand appears to think, in a congenitally organized system of congenital dispositions, or whether, as McDougall contends, they are referable to such general psychological laws as the law that the thwarting of desire tends to arouse anger. Stout suggests that even if the latter be the case, the concurrent operation of congenital dispositions is not excluded. McDougall ends his paper with a criticism of Shand's doctrine of sentiment, but the dispute is largely personal, and goes beyond the main topic.

The chapters in the new textbook of Pillsbury (7) which deal with instinct, feeling and emotion show a marked improvement over the corresponding chapters in the earlier book both in general treatment and in fullness of detail. They include reference to recent discussion and, while not presenting any new point of view, probably express more nearly the prevailing opinion on these topics than any other work. As a minor correction, it should be noted that McDougall does not now regard sorrow as a primary emotion. See the discussion just referred to.

Angell (1) contests the view held by many psychologists that James's theory of emotion has been demolished by the work of Sherrington and Cannon. The former, he thinks, only shows that the motor impulses which normally pour into the muscles of the head and forelimb region are not notably reinforced by impulses from the viscera; the degree in which the animal's consciousness may have been modified is uncertain. The latter only shows the extreme difficulty of regarding visceral activities as a basis for differentiating emotions. Neither shows either that the emotion precedes the expression, or that different emotions are not due to differences in the total instinctively conditioned response, which was James's theory.

Jensen (5) finds in "fear," taken in the broadest sense, a potent cause of the acute intestinal disturbances which allow toxic substances to stream into the blood. The effects are analogous to those occurring in shock during abdominal operations. Some clinical facts are adduced in support of the hypothesis. The synop-

sis which Hyslop (4) gives of an article on anger suggests a thorough treatment, but the article itself is rambling. It goes back to the early Egyptians and has much to say about running amok, being evidently inspired in part by the example of Germany in the present war. In the latest and, alas, the last of the many contributions made by Ribot (8) to affective psychology, the traditional treatment of the sublime as specifically an æsthetic emotion is disputed. He finds, instead, that the æsthetic sublime is only one of many kinds, the most impressive kind being the religious. Its analysis shows two fundamental elements, one affective, fear, the other intellectual, the apprehension of an imposing force. The secondary elements are, for example, the feeling of our own inferiority, the contrasted feeling, through sympathetic participation, of exaltation, the feeling of security and the confused feeling of depression translating the vague tendency to fear. Ribot concludes characteristically—and this may perhaps be regarded as his final legacy—with a criticism of the earlier “intellectualistic” treatment of the feelings as consisting of pleasure and pain instead of regarding these affections as expressions and signs of the profounder instincts, appetites, tendencies and desires, in a word, of motor phenomena. He ascribes to this cause the traditional treatment of the sublime.

Federn (2) corrects the opinion of some analysts that Freud's principle of pain-pleasure applies solely to the unconscious and that his principle of reality applies to the conscious by pointing out that the former does, indeed, exclusively control the unconscious, being essentially connected with the *libido*, but that it also operates to produce some of the most valued results of civilization, and that by the principle of reality Freud understands, not the general adjustment of the individual to reality, which is due to the action of both principles, but a psychic mechanism, the greatest use of which is found in the methods of the natural sciences. For Freud's (3) own treatment of the pleasure-producing mechanism of wit, it is sufficient to refer to the review of his work in a forthcoming number of the BULLETIN.

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ATTENTION AND INTEREST

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Adams (1) in his recent book brings together the results of several of his earlier experiments on attention in advertising not mentioned in these reviews. The right-hand page is noticed much more frequently than the left, the top of the page more frequently than the bottom, the outside edge has a higher value than the inside. Study of the effect of size upon attention by noting the number of times objects of different sizes were first seen proved that attention increases with size, rapidly at first, then more slowly. A square of 2.25 sq. in. is seen 1.78 times as frequently as one of 1 sq. in., one of 4 sq. in. 2.05 times as often; one of 9 sq. in. 2.74 times as often. Experiments by the same method showed that red, orange, blue and black are most likely to attract attention.

Two researches by the introspective method may be mentioned. Dallenbach (4) extends his earlier study of the range of attention and the influence of distraction and change to a study of cutaneous sensation. This study confirms the other that two types of individuals may be distinguished with respect to distribution, the two-level and multiple-level types. "Intensive changes and changes to a greater intensity or extent are more compelling than are extensive changes and changes to a smaller intensity or extent." Curtis and Foster (2) compared the effect of intensity and size upon the clearness of a Greek cross. In short exposures the observers were to judge whether one or the other of two crosses which were varied in size and intensity and exposed for 110 σ was the more clear. Observations of three subjects in 200 experiments each seemed to show that change in size had no effect.

In work primarily with images Miss Clark (2) obtains evidence of characteristic eye movements with secondary or voluntary attention. These are transferred to the examination of the image by association with the actual visual perception. As one turns the

eyes to make parts of an object more clear, so also if one is anxious to make sure of part of an image the eyes turn as they would if the actual object were presented. The movements occur as clearness increases, both probably as a result of voluntary attention.

Woodrow (5) by his detraction method demonstrates a similarity of the degree of attention to different stimuli which convinces him that there is a general factor in all attention. He finds for twelve subjects a coefficient of correlation between attention to cutaneous, auditory and visual stimuli of .78, .78, and .76. Attention to touch is highest and sound and light follow in order named. It is less in choice reactions with a changing intensity of light as the stimulus. The author concludes that attention depends upon a number of different factors, one of which is constant for each individual. This may be called general capacity for attention.

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PSYCHOPHYSICAL MEASUREMENT METHODS

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Weiss (13) reports an important contribution to the study of sound intensities. In the first part of this paper the author describes a very intricate and complicated apparatus for the controlling of the intensity of auditory stimuli and for the producing of pure tones. This apparatus, which seems to have particular merit, may also be used in part in visual experiments where a constant illumination is desired. The author conducted some preliminary experiments on the influence of the method of presentation upon the intensity relations between tones. The facts of adaptation, *i. e.*, the influence which the character of the preceding tones has upon our perception of a tone, are simply unknown. Four experimental procedures were employed, and the results were taken in accordance

with the method of supraliminal increments. The results show in general that in both ascending and descending series the reaction was premature, *i. e.*, the tones were judged equal before they were actually objectively equal. Ten standard tones were employed and the phenomena characteristic for each experimental arrangement turn out to be rather evenly distributed over these different intensities, although at times the central values seem particularly sensitive for some arrangements and particularly insensitive for others.

Rich (10) reports an experimental determination of tonal volume at different parts of the tonal scale. Stern tone-variators and a piston whistle were employed as stimuli, and the results were taken in accordance with the procedure of the method of constant stimuli. The results show that the limen values for tonal volume increase very regularly and markedly with an increase of pitch. The relative limen values, *i. e.*, the limen of volume divided by the vibration frequency of the standard tone, remain relatively unchanged for the range investigated, namely, from 110 to 6,400 vs. The size of the coefficient of precision decreases markedly as one goes from the lower to the higher pitch standards. Some introspective data tend to show that the judgments of tonal volume, whose limens differ from those of pitch both in magnitude and course, were made on the basis of the attribute of volume itself, inasmuch as the secondary criteria tended to be eliminated by practice.

Titchener (11) contributes a critical discussion of ethnological psychological tests in general, and of the results of the Cambridge Anthropological Expedition to Torres Straits in particular. He first criticizes McDougall's finding that the two-point tactual discrimination of the natives was about twice as refined as that of Englishmen. Titchener objects to the method on the ground that it is too suggestive, and that it does not take into account the perceptive forms between one-point and clearly two-point. He also points out that the method employed "bears all the earmarks of an incomplete psychophysical method" as parts of several methods were employed without testing the reliability of the combination. Indeed, Titchener reports the results of a little experimental investigation under the suggestive conditions, and obtains a limen for dual impression of less than zero. Titchener also criticizes Rivers's work on color vision reported in the same investigation. Conditions such as those of general illumination were not carefully controlled, and these factors alone might account largely for the

results obtained. But his chief criticism of this particular experiment is on the matter of the color nomenclature used by the Murray Islanders. He enters into a long philological discussion and shows that the descriptive words used by the natives are capable of a very different interpretation and translation than that given by Rivers. In conclusion, Titchener discusses the requirements of a field test, and advocates the abandonment of the present psychophysical methods in the shortened form in which they are usually applied in anthropological work, and suggests a return to the "all or none" type of determination for the field work; this to be supplemented by extended laboratory tests on a few subjects carried on in terms of the strictest forms of the psychophysical methods.

De Laski (5) begins a systematic quantitative exploration of the perceptive forms below the two-point limen in cutaneous sensitivity. A practice series was first employed so that the subjects could memorize the perceptive forms of spot, line and dumb-bell. The author believes that the judgment is made, in determinations by subliminal cutaneous stimulation, on the basis of the qualitative aspect of the form of the perception rather than by the quantitative criterion of length. Carnes and Shearer (3) report an experimental investigation of the problem of mechanical and manual stimulation in the determination of the cutaneous two-point limen. The Jastrow æsthesiometer was used and, for the mechanical stimulation, this was fixed to a Titchener applicator. The authors find that the mechanical form of application of the stimulus gives both a lower limen and a higher value of the coefficient of precision than does the manual form of application, and hence has a slight scientific advantage. The differences are small, however, and for all practical purposes, careful manual stimulation seems to be adequate.

Fernberger (8) reports the results of a study of the influence of mental and physical work on the formation of judgments in lifted weight experiments. Two separate experimental series were employed, the two factors being investigated at different times. The mental work consisted of a half-hour's reading of difficult German, and the physical work consisted of tiring the hand with an ergograph, up to the point of painful fatigue. The method of constant stimuli was employed, and the work series in each case were compared with a normal series of judgments which were taken during the same experimental sittings. It was found that mental work has a very variable effect upon the final values obtained in such an

investigation, both when we compare the results of the different subjects or of the same subject from time to time. The average values for all of the subjects for the series after mental work when compared with those before the work was performed turn out to be almost identical. Physical work, on the other hand, has a marked tendency to decrease the size of the coefficient of precision of the heavier judgments, and to decrease the size of both the upper and lower thresholds; to increase the size of the interval of uncertainty over 30 per cent. on the average; and to decrease markedly the size of the point of subjective equality. Fernberger (6) also reports an investigation of the effects of the initial stages of practice in lifted weight experiments. Urban had studied the effects of extended practice, and the present paper is an attempt to determine the practice effects within the first 100 judgments on each of 5 pairs of comparison weights. The method of constant stimuli was used. The results show that progressive practice increases the values of the coefficients of precision, and decreases the values of both the interval of uncertainty and the point of subjective equality. The effects of this progressive practice are stronger at the beginning of the experimental series and decrease at first rapidly and then more slowly as the experimentation continues. The author advocates, therefore, the taking of at least 50 judgments on each of five comparison pairs of weights in the determination of thresholds for anthropometric purposes. This is a much larger number than has been frequently used by anthropometrists. Although by no means eliminating the effects of practice, the author considers this recommendation as a compromise between time and accuracy, both of which are important factors in determinations of this sort. Boring (1) takes issue with this last recommendation. From the theoretical side, he insists that we are not interested in thresholds but in differences between thresholds. Hence Boring works out a determination of the probability of the significance of the difference between the two thresholds. He gives the formulæ and works out the values for a series of data of the two-point limen for forearm and eyelid. These are calculated in series of tens and, in some cases, the probable correctness of this difference, which is very large, gives a value of unity (absolute certainty) and in all cases it is highly significant.

Von Frey (12) takes up again the problem of comparing weights as estimated by resistance and by lifting. In the first case the arm was placed in a rigid mould so that lifting was not possible. In the

second series records were taken to determine the height and form of the lifting curve. The lifting procedure gives a threshold value which is larger than that for mere resistance because, the author believes, in the case of lifting we must lift the limb as well as the weight, and this tends to obscure to a certain extent the intensity of the kinæsthetic sensations caused by the lifting of the weight itself. In the case of the lifting procedure, however, there is a certain superiority as the subject was permitted numerous rhythmic repetitions, and hence the different sensations were brought in consciousness many times. Curtis (4) studied the duration of auditory, visual and tactual stimuli. The author was primarily interested in an introspective analysis of the durative judgment, but some quantitative results were also taken. The method of constant stimuli was employed. The results show that when a filled time is followed by an empty interval, the latter is usually underestimated. When the opposite temporal relations of filled and empty periods were employed, the limen values show great variation. Great variation was also found between the different subjects in their ability to handle the equality judgments. It was also determined that the reaction-time for the doubtful judgments was somewhat longer than for the judgments of positive equality, and these in turn were longer than those for the difference categories. The differences between active and passive attitudes on the part of the subjects toward the judgments was investigated. The results show that the limen values are smaller and the coefficients of precision are larger under the active instructions. In the series with visual stimuli a time error is evident in the case of four of the five observers. A similar marked time error is evident in the case of the tactual stimuli, and great differences in the size of the interval of uncertainty were found for the different observers in this series.

Fernberger (7) attempts to apply the concepts of the thresholds, the interval of uncertainty, and the other psychophysical values to certain types of data which are of interest in pedagogy and sociology. The puberty-age distribution lends itself to this sort of treatment inasmuch as the results fall into three mutually exclusive categories, and the results closely approximate the form of the curves of the psychometric functions. The author submits the data of the age frequency distribution of the different stages of transition of puberty obtained by Crampton to the calculations of the method of constant stimuli, and points out the significance of the final values obtained. Bradford (2) criticizes the existing standard measures of variability

(the average deviation, the standard deviation, and the coefficient of variation) when they are applied to the variability of performance of an individual. This is true when progressive practice enters into the results because all of these values are calculated from a fixed mean, while actually the mean value is constantly changing. Hence the author suggests a measure of variability which is calculated from a progressive mean. This is applied to some results of backward and forward alphabet tests obtained from a group of London schoolboys. The author correlates variability, as measured by his new values, with improvability. Harris (9) reports the results of some 15,000 estimates of the number of beans in samples of from 50 to 200 each. The subjects worked with knowledge of results. The results show that the personal equation, a tendency to estimate either too large or too small, seems to be remarkably little influenced by practice. But there is a distinct decrease in the size of the standard deviation showing an increasing steadiness of judgment due to practice. It would appear that the rate of this change is not uniform, but is most rapid at first and then has a tendency to decrease.

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CORRELATION

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General versus Group Factors.—Is a general factor necessary to explain the correlation between tested psycho-physical processes? The answer is gradually becoming more clear with the continuation of the discussion. Thomson (39) constructs a hypothetical hierarchy of coefficients and reproduces it with throws of dice. It meets Spearman's criteria for determining whether the correlations are explained by a general factor and shows average correlations approximating $+1.00$ between columns of coefficients. By the method of construction employed for the table, however, we know that there was no common factor; but only *overlapping group factors*, such as might be found if different tests embraced several group factors. Since Spearman admits the existence of group factors, the problem of interpretation is to decide whether overlapping group factors may not explain the correlation of columns of coefficients, without resort to any general factor common to all the processes. Thorndike's theory of levels Thomson calls a hypothesis of "non-overlapping group factors." The group factors that Spearman used in his hypothetical discussion were of this non-overlapping form, which he suggested would tend to give a correlation either zero or negative between the columns.

To this evidence of non-proof Spearman (36) replies briefly that the special arrangement of overlapping factors which Thomson submits might occur, but that the chance of it would be so small as to be negligible. He proposes to demonstrate in a subsequent paper, when his duties as major in the army permit, the nature of the principle represented in the distribution of factors in this specific case. It involves, he says, psychological absurdities and reintroduces the general factor by the back door.

Carey (5) shows both empirically and theoretically that a

hierarchy of coefficients may give correlations between columns all the way from $+1.00$ to -1.00 provided that the general factor is *supplemented* by group factors, which affect the upper, middle and lower portions of the columns, even when these group factors do not overlap. In a table of intercorrelations for school marks of pupils in the elementary schools he finds two such factors affecting a group of school studies, the larger being a motor factor affecting marks in writing, painting and needlework, the other a small factor of association between written words and their meanings affecting marks in composition, reading and spelling.

McCall (24) states that the correlations between columns of his table of raw coefficients ran all the way from $+1.00$ to $-.95$, a number were $-.95$. "If future researches substantiate our contention, it is almost a pity, for Dr. Spearman's theorem promised to be the Rosetta Stone of correlational psychology." He does not state how fully he followed Spearman's plan in arranging a hierarchy of coefficients and rejecting those which did not conform to Spearman's criteria. Gains in ability to score in tests of adding, mental multiplication, typewriting and cancelling show such low correlations that Thorndike (41) concludes that the capacity to learn these operations is specialized. Stecher (37) finds her "tests of nervous and mental control to be a great deal more specialized than we had previously believed to be the case." Kitson (23) corroborates the finding that correlations between school marks and combined test scores are higher than with separate tests, thus indicating compensations.

Heredity versus Environment.—The problem of explaining familiar resemblance by inner or outer factors is being analyzed more carefully by correlation methods. Goring's fundamental research (10) in this field is so important that it should be more generally available. This research covered scores of measurements and objective facts about three thousand British convicts. It took about ten years to complete. The conclusions rest upon the most complete treatment of the data under the advice of Karl Pearson of the Biometric Laboratory. It is a classical example of the importance of multiple correlation in resolving complex problems. It first thoroughly refutes the claims of the school of Lombroso as to the existence of a physical criminal type by showing that over thirty suggested physical characteristics are not related to criminality. Goring then demonstrates that criminality runs in families, but mainly through its relation to intellectual deficiency, which

shows a correlation of .66 with criminality. Through deficiency it becomes associated with alcoholism, epilepsy and social profligacy. Moreover, numerous external factors, such as example in the home, schooling, size of family, economic and employment conditions, were found to have no significant relation to frequency or length of imprisonment. The correlations indicated that "... relatively to its origin in the constitution of the malefactor, and especially in his mentally defective constitution, crime in this country is only to a trifling extent (if to any) the product of social inequality, or of adverse environment. . . ."

Cobb (6) makes an illuminating analysis of the question whether the inheritance of arithmetical ability is of the blended or segregating form. The study is entirely objective depending upon tests of parents and children by the Courtis tests. The problem was as to the resemblance to like, unlike and mid-parents in the *differences in the same person* between abilities to do the four simple operations of arithmetic and copying figures. The correlation is .60 with like parent, .01 with unlike and .49 with mid-parent. The results thus support the hypothesis of segregation of these abilities. The methods described in the paper promise to give the most fundamental answer to this problem of blended inheritance which has yet been forecasted.

Holley (14) shows that years of schooling are rather closely (.50 and over) and repeatedly related to certain factors in the home objectively measured, such as size of library, rent, taxes, number of rooms and years of schooling of the parents. This is contrary to the non-relation found by Van Denburg for economic factors. He introduces an important variation by comparing some of the results with those for adopted but unrelated children. Years of schooling of parents is more related to years of schooling of children than to school retardation of children. The author concludes without sufficient evidence that "environment influences more often cause a child to stop attending school than lack of ability to do the work." He might have approached this more directly if he had determined whether years of schooling of children were more closely related to school retardation than to the home factors. One is in doubt how fundamentally years of schooling are related to ability. Early elimination from school is "largely due to social and hereditary factors outside the school over which the school has little or no control." Size of family has no appreciable effect on persistence in school. Men and women tend to marry those of similar length of

schooling. The number of books in the home was more closely related to years of schooling of children than any other objective factor used. English (9) thinks that the generally low correlations of his tests of children with their ages "is a direct proof that environment and the tests have also a low correlation."

Method.—The calculation of coefficients has been made much easier by two very practical contributions. Thurstone (44) has furnished a formula for calculating the product-moment coefficient by means of the adding machine without figuring individual deviations from the central tendencies. It is very important to note, however, that failure to carry the means to sufficient decimal places may seriously alter the result. The chances of arithmetical errors are reduced to a minimum, and exact means are used. Ruml (23) developed the same formula so far as it applies to the standard deviation. Kelley (19) provides very valuable tables for calculating partial correlation coefficients, which Thorndike estimates will reduce the labor 80 per cent. It should now become a common practice to use the partial regression equations for weighting the various tested factors so as to get the best prediction of the series of measures which is taken as the standard. Accuracy, speed, etc., for a single test or the relative value of different scorings may be properly determined. The author also gives a method for approximating the weighting when more than four variables are involved. If the tables reach a second edition he promises that they will be carried out for further decimals.

Ruml (34) suggests that the working value of a test cannot always be determined by correlating performance in the test with the exact evaluation of each individual's ability, since the practical problem is often to divide the individuals into two or more groups and their exact positions within each of these groups is not important. He ingeniously utilized a Pearson formula for determining which test will best divide a group into subgroups containing particular percentages of the total group. Stating the practical problem in another form his method will predict what division of a group can best be made by a particular test. Whenever it is desirable to evaluate tests that are to be used in the selection of portions of groups of individuals in education or business, he recommends his procedure as preferable to simple correlation. The method is illustrated with examples so that it can easily be utilized. Otis (27) sets forth a suggestive method for plotting a "curve of rank relation" which may represent very simply the reciprocal relations

between two variates by a single line. It assumes that the true correspondence will be more nearly approximated by the two scores having the same rank than by the two scores of the same individual. On the basis of this curve the correlation may be calculated by a "deviation formula." Certain advantages over the product-moment and the "foot-rule" are pointed out. Kelley (18) gives a method for estimating the reliability of a combined record for two scores compared with the true ability determined by the average record of a large number of scores with tests of the type of the spelling scales. The use of the order of merit method in connection with correlation is so common that it is well to have reference to Thorndike's (43) method of combining incomplete judgments of relative position of N facts by N judges into one order of merit.

A mathematician, Grove (11), offers vigorously worded criticism of some correlation work of psychologists, although he points out no cautions which have not previously been noted, often by the men themselves. To those who continue to use Spearman's formula for correction of raw coefficients he says: "Spearman's plan of making very few observations and making hypothetical corrections on stated assumptions is a way that makes no appeal to a man who has the scientific method in his blood. To such juggling, the latter quietly shakes his head and *sotto voce* says 'Ignoramus'."

At his colleagues Thorndike and Hollingworth, he hurls bolts of literary lightning which seem to hit only their shadows. As a summary of the cautions to be remembered the papers are admirable.

New Ways of Using Correlation.—By correlating the ranks of different motor learning problems, Pechstein (29) compares human and animal learning. "It shows that there is no royal road to mastery for the human not open to the rat." Doll (7) provides, probably for the first time, evidence that mental deficiency goes with low physical measurements. He avoids the usual error involved in comparing with a random group the feeble-minded who are selected from an undersized social class. He follows the plan of the biometric laboratory, which shows that greater degrees of deficiency correlate with greater decrease in physique. To the writer it seems that his series of coefficients may also indicate that physical measurements increase in their diagnostic value as they involve more nerve action. The partial correlations between mental ages and physique for constant chronological age are for deficient girls: weight .34, standing height .39, sitting height .47,

vital capacity .63, left grip .67, right grip .69. His correlations are somewhat affected by the use of the product-moment formula for units of percentiles and of mental ages. The effect of using unequal units upon the coefficients is a problem which psychologists should consider seriously as it is a too common practise. Doll recognizes the difficulty and offers one series of coefficients calculated from the original data to compare with percentile records, the two series showing fairly close agreement.

Petersen and Doll (28) reason inconclusively that the feeble-minded, although showing lower average records, do not have less *sensory capacity* for the lifted weight test at the same mental ages than the normal children, because the correlation between the test records and the mental ages is higher with normals than with deficient. Their argument assumes that normals have greater intellectual than sensory capacity at the same mental age. They should also show that they are justified in assuming that a correlation with mental age is the same as with chronological age for normal children. Baldwin (1) shows a correlation of .70 between height and early pubescence for ten girls of different height. This introduces correlation of developmental changes for the same individuals. Bonser (3) interprets lower correlations for opposites and mathematics tests among non-graduates, than among those who graduate from high or who leave high, to indicate a selective influence of the school. Young (50) finds striking sex differences between form board records and placing graduated cylinders, eyes open and closed. Thorndike (42) indicates the inadequacy of the Binet scale to test mechanical skill and its close relation to tests of ability to deal with ideas expressed in language. Pintner and Patterson (31) find by correlation of two tests a year apart that the average of three trials with the form board gives a more stable score than the best of three trials or other scores. McCall (24) finds improvement at a speed test is not as good a measure as the average of practise scores. King (21) demonstrates the changing relation between college marks with early and late trials of the same test. Correlation is used by King (20) to criticize the statements of Judd and others that rapid reading goes with good reading. Doll (8) finds that some of Woolley and Fisher's statements about correlations, apparently made from their graphs without calculating the coefficients, are not supported by the calculations.

Applications in New Fields.—The most notable increase in the use of the correlation method has been in applied psychology and

education. In business Scott (35) used the combined firm rank of employees as a standard with which tests frequently correlate better than ranks given by executives after long acquaintance. Terman (38) found that tests correlate highly with salaries of men applying for positions as firemen and policemen. Hollingworth's *Vocational Psychology* (16) is an admirable summary of correlation data in this field. New results are given for estimated abilities as judged from photographs and acquaintance. See also Jones (17) on tests for telegraphy, Wells (47) on typewriting, Trabue (45) and Whipple (48). In regard to tests of educational products Otis (27) studies spelling tests, Breed and Culp (4) handwriting, Richards and Davidson (32) reading, Wilson (49) addition. Guillet advocates correlation exercises for normal school students. Mead and Holley find (25) that marks in a general method course agree better with estimates of practice teaching than college marks in the subject taught. Thorndike (40) finds that estimates of their interests and abilities by college students on the basis of their memories of what these were in elementary school, high school, and college correlate high. For example, estimated interest and estimated ability in high school correlated .89, estimated interests in elementary and high school .66. "On the whole, I believe, that the correlations given above are approximately what an omniscient observer of those persons would have found." Heck (13) finds time spent on home study is unrelated to school marks. His description of the significance of the probable error of the coefficient of correlation confuses it with the deviation of a regression. Myers (26) finds a significant negative relation between time of perfect learning and time taken to recall. Bonser (3) correlates the records of fourth, fifth and sixth grade pupils in his reasoning tests with their high school marks. With this important data it is unfortunate that he uses the method of unlike signs which is so uncertain. He fails to give partial correlations which would eliminate extraneous factors of age grade, etc., more satisfactorily than his broad divisions.

Other Applications.—Negative correlations of desirable motor traits with intellectual measures are found by McCall (24), Stecher (37), and King (21). Those interested in correlations of various tests with each other, with school marks and with estimates should see Weidensall (46), McCall (24), Bell (2), Kitson (23), English (9), Guillet (12), King (22), and Stecher (37). The last found that no motor test gave a reliable positive correlation with mental

multiplication. Speed and accuracy in a speed test correlates positively, Thorndike (41).

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SPECIAL REVIEWS

Advertising and Its Mental Laws. H. F. ADAMS. New York: Macmillan, 1916. Pp. xi+333. \$1.50.

The book is written in an easy, readable style. It contains considerable original experimental data upon nearly all the problems of the psychology of advertising, as well as frequent reference to the experimental work of others. It is written from the point of view of the student of psychology rather than the advertiser; but the psychological principles involved are developed in such a simple and clear manner that the advertising man should find it interesting and profitable.

Psychology, according to Adams, should be able to help the advertising man in two ways. In the first place it should aid him to understand himself and his strong points and his limitations. In the second place psychology should help him by giving him the various laws of the mental processes: how to get and hold the attention of the reader; how to arrange the advertisement so that it may be easily read; how to make a commodity remembered by those who read the advertisement; under what circumstances to use "reason why" copy and what kind of an argument is most likely to appeal; what are the desirable emotions to arouse and how to arouse them; and finally how to bring about the desired action on the part of the reader. The author then discusses briefly the facts of attention, memory, association and action in their relation to advertising. Advertisements are analyzed into their elements, such as position, size, type of appeal, pleasantness, surrounding material, etc., and the effect of each of these elements is investigated experimentally.

C. E. RAGSDALE

PRINCETON UNIVERSITY

The Science of Musical Sounds. D. C. MILLER. New York: Macmillan, 1916. Pp. viii+286.

The volume consists of eight lectures given at the Lowell Institute in 1914. The first lecture defines sound and discusses its physical nature. In the second we find a discussion of the characteristics of tone, and the method of determining pitch frequency and tone quality. The third treats of methods of recording and photographing sound waves, including a description of Miller's "phonodeik" which permits an optical registration of the wave for purposes of projection and photographing. Then follows in lecture IV a discussion of analysis and synthesis of harmonic curves, and a description of Miller's apparatus for analyzing curves secured by means of the phonodeik. Lecture V is concerned with the influence of the horn and diaphragm on sound waves, and the necessary corrections of the sound records secured by the phonodeik.

Lecture VI reports results obtained in analyzing the tone qualities of various musical instruments. The physical effects of generators and resonators on the resultant tone are carefully distinguished, while the influence of the material from which the instrument is made is demonstrated with special reference to organ pipes. It is shown that a zinc pipe with hollow walls whose dimensions are those of a wooden pipe giving the tone G_2 , gives a tone, F_2 , when the walls are empty, and a tone, E_2 , when the walls are filled with water. The superiority of gold flutes, over those of wood or silver, is due to their thin, soft, flexible walls, which are nevertheless massive by reason of the density of the gold. The tuning fork is found to give a simple clang-like tone with an unperiodic partial. The flute has a relatively simple tone when blown softly, though it contains a weak octave and traces of higher partials. When played loudly it is over blown and the first overtone becomes the most prominent partial. The violin tone shows a characteristic prominence of the third, fourth and fifth partials. Since the lower tones have very weak fundamentals, the hearing of them is attributed to beat tones (difference tones?) of the higher partials. The oboe tone contains loud high partials; twelve or more are registered, of which the fourth and fifth predominate. The clarinet registers twenty or more partials, of which twelve are important, particularly the seventh and ninth. The horn gives the entire series of partials up to the thirtieth, with the fourth, fifth and sixth most evident. The piano is found to have many overtones for the lower strings. The author concludes that no

difference is introduced by the so-called "emotional touch" of the pianist, yet variations in tone quality may be attributed to combinations of tones struck at intervals of a few hundredths of a second. The artistic touch is therefore a matter of time variation as well as of strength of the blow. With this factor duly considered, mechanical piano players should be able to duplicate the best results of the most skilled artists.

Lecture VII considers the physical characteristics of vowels. The Helmholtz fixed pitch theory appears to be substantiated rather than the theory which attributes vowel sounds to constant ratios among the partials. The optimal regions of pitch for the various vowels are indicated by an ascending series: *moo*, 326; *mow*, 461; *maw*, 732; *ma*, 900 to 1,240. At this point a bifurcation ensues, in that the succeeding vowels show two dominant partials, one of which trends higher and the other lower. Although the lower is the more intensive, the higher is the characteristic, since its absence converts the vowel to one of the lower order. For *mat* the pitch values are given as 800 and 1,840; for *met*, 691 and 1,953; for *mate*, 488 and 2,461; for *meet*, 308 and 3,100. Whispered vowels were also analyzed and found to give similar optimal frequencies, though usually they were somewhat higher. The final lecture considers methods of securing synthetic vowels, and includes a discussion of the relation of the science and art of music. By a careful adjustment of organ pipes until each corresponded to the requisite amplitude of a partial in a voice curve, it was possible to produce a close approximation to a particular human vocalization. It is further noted that in the translation of song lyrics care should be taken to select vowels to accord with the pitch of the voice tone. Baritones have less difficulty than sopranos in singing vowels on any tone because of their lower register. It is, of course, impossible to produce the low vowels on high tones, but not so to produce any and all vowels on a low fundamental.

As regards certain discrepancies between Miller's vowel frequencies and those established by Köhler,¹ it may be noted that Miller analyzed the vowels as uttered in the natural voice of an American. As his results seem to indicate a gradual transition from one to the other, there is no need to assume that his particular values would be optimal for the vowel sounds of the German language. They would perhaps not be acceptable to all who use the English language.

ROBERT MORRIS OGDEN

CORNELL UNIVERSITY

¹ Cf. Summary on Hearing, *PSYCHOL. BULL.*, 1911, 8, p. 97.

Analyzing Yourself. New York: Business Training Corporation, 1916. Pp. 138.

This little book is the first of twelve texts in a "Course in Business Essentials" planned to "cover a period of six months." The initial volume, as the reader is told, "is not an ordinary book to be read through at a sitting. It is in reality *an examination of yourself by yourself.*" The book, in fact, contains questionnaires, notable for their concreteness and for the directness and simplicity of their phraseology, on the health, appearance, and temperament of the reader. It contains also directions enabling him to test his own observation, memory, ability to recognize faces, concentration, reasoning power, and range of information. Most of the tests are clever adaptations of experiments already known. The significance of the book largely, however, consists in the ingenious inclusion, within the covers of a small volume, of (1) all the material needed for the tests, (2) a key to the tests, and (3) directions for rating (in per cents) the outcome of each questionnaire and each test, and for combining the results graphically into a "simple chart, that sums up the whole story into Your Curve of Personality."

The writer of this notice beguiled a railroad journey by working through the tests and questionnaires for herself and has since put the book into the hands of two people, one of them a boy of eighteen, wholly untrained in psychological methods. The result of this examination is the conviction not only that the book is likely to be useful to the young business man for whom it is primarily intended but that it bristles with suggestions for the teacher of elementary courses in psychology.

MARY WHITON CALKINS

WELLESLEY COLLEGE

The Dream Problem. A. E. MAEDER. (Trans. by F. M. HALLOCK and S. E. JELLIFFE.) Nerv. & Ment. Dis. Monograph, No. 22. New York: 1916. Pp. 43.

This paper was read at the Congress of the Psychoanalytical Society at Munich in September, 1913, and its primary aim is to answer objections made to a previous work wherein the writer, of the Zürich school, appears to have been misunderstood by his "Vienna colleagues," of the Freudian School. The thesis of the earlier paper, here restated and amplified, is that dreams show, upon analysis, not only a wish-fulfilment (pleasure principle), but a prophesy or foresight of the end toward which the dreamer (sub-

consciously) strives (reality principle). Dreams thus give "a clew to the direction which is suited to the reaction and strength of the patient in question." The typical Freudian interpretation of dream symbolism is accepted as a preliminary step in complete analysis, but, retrospective as it is, it omits the still greater significance of the latent dream: its "progressive side." "In the dream there is at work a preparatory arranging function which belongs to the work of adjustment." As an illustration of this point of view, Maeder, who long worked unsuccessfully in a chemical institute, now dreams repeatedly of making chemical analyses. He interprets these dreams not only, with Freud, as wish-fulfillments wherein the fruitful analyses of the dream compensate for the humiliations of his past failures, but finds further that they are a prophesy and index of his later actual success in *psycho-analyses!*

To psychoanalysis he ascribes the systematic introduction of genetic thinking into psychology, but affirms that this retrospective attitude alone cannot take us far. "A new field of work is now before us . . . the prospective road leads to reality; it promises us, therapeutically, the most important insight, just as the retrospective road once meant for us a great scientific gain . . . this gleam of light is to serve as a lighthouse" (sic!).

Thus do the psychoanalysts dispose of time! Our octopusian dreams not only drag up our yesterdays (buried with fond hopes of permanency), but twist their teleological tentacles into our to-morrows.

ELLIOTT PARK FROST

UNIVERSITY OF TENNESSEE

Honesty. W. HEALY. Indianapolis: Bobbs-Merrill, 1915. Pp. 220.

Healy embodies the conclusions drawn from hundreds of clinical cases involving juvenile dishonesty in a volume designed as a practical reference book for parents, teachers and social workers. The author purposely avoids the use of tiresome technicalities or theoretical discussions which might bore the lay reader, and after criticizing rather sharply the failure on the part of adults to appreciate the vital factors of childhood, points out the practicability of more thorough attempts at understanding and treatment, in chapters headed as follows: age of moral development, home conditions, companionship, discipline, amusement and adventure, habits, mental, physical and social, physical conditions, abnormal mentality correlated with stealing, and impulsions and obsessions.

A definite age of unmorality at about nine years, affirmed by Goddard and others, is denied, as is the influence of poverty toward dishonesty. Immoral homes, lack of healthy home interests, social temptations derived from the desire to be like one's school fellows, and the desire for thrilling adventure are all potent influences toward the habit of dishonesty. The school is arraigned, not only for its failure to provide healthy interests for children which will act as preventives, but for its positively harmful influence in forcing upon many weak but moral children the companionship of delinquents which of necessity leads them astray. Picture shows are held responsible to some extent for juvenile stealing; directly, in that petty thieving depicted on the screen is sometimes copied by the child in real life; indirectly, and this effect is much more frequent than the other, in that many children steal to provide themselves with funds wherewith to attend the "movies." Regulation of the attendance of children upon these and all other places of amusement is strongly urged upon community welfare organizations. Cases of stealing due to "gang influences" can only be dealt with by complete severance of all ties of association with the old environment and companions. Individual cases may sometimes be helped by sharp discipline, if taken early enough, and quick corporal punishment is often most effective. Great care must be exercised in such cases, and unless one understands the individual, and can punish intelligently, the case is best let alone. Where the stealing is the result of early obsessions, or of impulsions, or of sexual practices secretly indulged in or repressed, treatment should be prescribed by a trained "medicopsychologist," and his efforts must be intelligently and consciously seconded by parents or guardians if successful results are to be attained.

Throughout the whole volume is emphasized the necessity for sympathetic, individualistic study of each case instead of the treatment of offenders *en masse*.

HELEN B. HUBBERT

RANDOLPH MACON WOMAN'S COLLEGE

BOOKS RECEIVED

- BOIRAC, E. *L'Avenir des Sciences Psychiques*. Paris: Alcan, 1917. Pp. 301. 5 Fr.
- FERRI, E. *Criminal Sociology*. (Trans. by J. I. Kelley & J. Lisle; ed. by W. M. Smithers; introd. by C. E. Ellwood & Q. A. Myers.) Boston: Little, Brown, 1917. Pp. xlv + 577. \$5.00
- PAPILLAUT, G. *Science français—Scolastique allemand*. Paris: Alcan, 1917. Pp. 154. 2.50 Fr.

NOTES AND NEWS

PROFESSOR R. P. ANGIER has been promoted to a professorship in psychology at Yale University.

PROFESSOR R. M. YERKES, of Harvard University, has been appointed professor of psychology and director of the psychological laboratory at the University of Minnesota.

A MENTAL HYGIENE CLINIC has been opened at the San Francisco Polyclinic, with Professor Lillian J. Martin as psychopathologist. The aims of the new clinic are to deal with the mental hygiene of the mentally well and ill, of all kinds and ages.

THE NATIONAL RESEARCH COUNCIL has appointed the following committee on psychology: J. McKeen Cattell (Columbia University); Raymond Dodge (Wesleyan University); Shepherd Ivory Franz (Government Hospital for the Insane); G. Stanley Hall (Clark University); C. E. Seashore (University of Iowa); E. L. Thorndike (Teachers College, Columbia University); John B. Watson (Johns Hopkins University); G. M. Whipple (University of Illinois); R. M. Yerkes (Harvard University), Chairman.

PROFESSOR S. W. FERNBERGER, of Clark University, has been accepted for, and is now in training at, the Officers' Reserve Camp, at Plattsburg, N. Y.

THE following items have been taken from the press:

PROFESSOR J. B. PRATT, of Williams College, has been appointed Mark Hopkins Professor of Intellectual and Moral Philosophy at that institution.

PROFESSOR W. F. DEARBORN has been promoted to a full professorship at Harvard University.

PROFESSOR E. L. THORNDIKE, of Teachers College, Columbia University, has been elected a member of the National Academy of Sciences.

DR. PIERRE MARIE has been appointed to the chair of clinical neurology at the University of Paris, to succeed the late Professor Dejerine. Marie's recent work on the revision of the doctrine of aphasia has been of special interest to psychologists.

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THE
PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

GENERAL PSYCHOPATHOLOGY

BY E. E. SOUTHARD

Commission on Mental Diseases, Massachusetts

The reviews and summaries of this number of the BULLETIN are intended to deal with general or theoretical psychopathology such as the large German textbooks on psychiatry set forth in the portions termed *general*, e. g., in that portion of Kraepelin's well-known textbook termed *Phenomena of Insanity*.

Last year a number of pages was devoted to Kraepelin's *Psychiatrie*, 1909-1915, although no complete analysis of that remarkable work could be made. I wish to call especial attention to the part which the concept of infantilism plays in Kraepelin's attempt to resolve the more difficult materials of psychiatry, those, namely, which are taken up in the early part of the fourth volume. Kraepelin approaches the psychopathias with due humility. A particularly interesting discussion stands at the head of Section XVI, on psychopathic personalities. These Kraepelin approaches as forming an intermediary region between undoubtedly morbid conditions and mere personal peculiarities. Kraepelin of course grants that, if all such inborn peculiarities were *sensu strictiori* to be regarded as degenerative, then traces thereof would never be missed in a solitary human being. The truly "morbid" is regarded as a deviation having a considerable significance for somatic or psychic life. Morbidity is accordingly a somewhat arbitrary concept. It has been, according to Kraepelin, the service of French physicians to sharpen our understanding of these morbid trends or constitutions, which Kraepelin likes to call "psychic malformations."

Some psychopathic personalities resemble the maniacal, depressive, irritable, and cyclothymic constitutions, previously described by Kraepelin as more or less thoroughly satisfactory subentities under the general concept of manic-depressive psychosis. Clinical observation is here aided by the fact that the relatives of such persons are often victims of pronounced manic-depressive disorder. Again, many of these persons look in the schizophrenic direction, and these patients may scarcely differ in any recognizable way from victims of dementia præcox in its early phases. Here are the dullards and weaklings, or the "odd sticks" with a variety of peculiarities of thought and action. Again, there are paranoid persons, and there is a paranoid personality which may show no tendency to the formation of a true paranoia. Moreover, there are cases of psychopathic personality that look in the direction of epilepsy, although this field is one difficult to evaluate.

The relations of psychopathia (in this broad sense) and hysteria are still more intimate. It would even be proper to say that hysterics form a subgroup of the group of morbid personalities, in which archaic forms of emotional reaction stand out. Eliminating the manic-depressive tendencies, the mildly schizophrenic, and the epileptic changes, the rest of the field of psychopathic personalities is regarded by Kraepelin as containing a number of developmental arrests of a circumscribed nature. Not only hysteria but paranoia (here Kraepelin refers to the so-called true paranoia and not to paranoid dementia præcox) are perhaps to be better understood if they are regarded as peculiarities closely related with the undeveloped mental life of the child. Hysteria would then be a kind of infantilism in the emotional sphere, whereas paranoia may be suspected to be a kind of infantilism of the higher intellectual functions. But the concept of infantilism is still more broadly used by Kraepelin. There are other permanently abnormal insufficiencies of the personality than hysteria and paranoia, viz., certain insufficiencies termed by Kraepelin *originär*. These conditions—including one Kraepelin terms *nervosity* (neurasthenia and some of the psychoneuroses), *Zwangsneurose* (psychasthenia and obsessive psychoses, and the like), impulsive psychoses (including such forms as pyromania, kleptomania, and the like), and the sex perversions—are treated by Kraepelin separately from the psychopathic personalities on the ground that the former are more pronouncedly morbid conditions. This group exhibits infantilism of the instincts and of the will. In the instance of neurasthenia,

we are perhaps dealing more with an inborn hyperbulia with a retreat from the difficulties of life. In the other forms, such as the impulsive and sexual psychic disorders, we are dealing with a "derailment" of impulses and instincts which are not properly dominated by a well-developed will. Just as imbecility and idiocy represent more or less high-grade *general* infantilism, so these diseased-groups just mentioned form instances of *circumscribed* infantilism. Consequently, there are all manners of intergrading steps between feeble-mindedness and the psychopathias.

I have thought it worth while to bring this matter out in some detail because it seems to prove that a closer relation of all these matters with psychology must be brought about if we are to understand the psychopathias. We may not be able to test metrically these psychopathias at the present time. Still, if they are in any sense infantilisms, we should eventually be able to measure them. As it stands, it would appear that in the large field of feeble-mindedness, we now distinguish over and above idiocy, imbecility, and feeble-mindedness proper (morosis, Tredgold; moronity) two forms of permanent inborn weakness of mind: a metrically testable form variously termed subnormality, simplicitas, stupiditas, and the like, and a form not now metrically testable and, as it were, only qualitatively demonstrable weakness. It is this fifth form of feeble-mindedness that is covered in part by the term *constitutional psychopathic inferiority* of some modern workers (*e. g.*, the New York classification of mental diseases). The future of this topic is clearly not in the hands of psychotechnicians performing more and more tests in known ways; but the whole field awaits the characterologist who shall describe the field, and the ingenious worker in the field who shall provide special tests in the field of instincts, emotions, and will.

A piece of practical work related to this matter has appeared in the interesting first number of the new journal, *Mental Hygiene*, to be published quarterly by the National Committee for Mental Hygiene. In a paper on "Unemployment and Personality," H. M. Adler (3) studies paranoid personalities, inadequate personalities, and an emotionally unstable group. The inadequate personalities are, roughly speaking, those that can be proved by available tests to be psychopathic, or persons suffering from a variety of mental diseases with a net effect of lack of judgment and intelligence. The paranoid personalities are egocentric, "limelight" schemers, often contentious, suspicious, and apt to be ingrates. Some 43

cases of unemployed out of 100 cases studied belonged in this paranoid group. The emotionally unstable group contained but 22 cases as against 35 in the inadequate group.

Adler (4) has gone still farther in popularizing the concept of psychopathic personality in a paper in the increasingly useful *Journal of Criminal Law and Criminology*. He summarizes the sub-forms of psychopathic personality as follows: Excitability (*die Erregbaren*) relates to a class of persons often delinquent as the result of some external irritation. The emotional instability of these cases is often combined with supranormality as far as mental tests go. A good many of the histrionic suicides fall in this group. Instability (*Haltlose*) characterizes a second group of (as a rule) fairly intelligent persons whose suggestibility of will is a chief trait. These psychically immature persons need special protection from alcohol. They are especially given to sex difficulties. A third group of persons exhibit a psychopathic trend, and these persons are termed by Kraepelin *Triebmenschen*. Spasmodic will impulses control them. Many of the tramps belong in this group as well as a variety of truants, profligates, and periodic drinkers. A fourth small group are the eccentrics, including the pathological liars and swindlers that have been studied especially by Healy in this country. A fifth group of anti-social persons are adequately intelligent but socially dull, being lazy and untruthful and incapable of any deep emotion. Some of these cases seem to have terminated in paranoid dementia præcox. Prichard's (1835) group of moral insanities belongs here, at least in part. A sixth group of contentious persons are of but moderate intelligence. Adler proposes a system of mental and emotional exercises for the purpose of habit formation, proposing to call this orthopsychics. A beginning at such training in unemployed cases was made under his charge at the Psychopathic Hospital, Boston.

Both journals from which I have just quoted are becoming of special value to psychologists. Reference may be made to Wells (51) on mental adaptation, and to a special article by C. Macfie Campbell (11) on the subnormal child (valuable tables).

Walter E. Fernald (14) gives exceedingly valuable tables illustrating his Waverley work with the mental test, clinical, and pedagogical evaluation of his cases. The fields of study which he evaluates are ten: Physical examination; family history; personal history; school progress; school examination; practical efficiency; economic efficiency; social reaction; moral reactions; psychological tests.

It is of note that both these journals—*Mental Hygiene* and the *Journal of Criminal Law and Criminology*—are often found reviewing the same books, and the drawing together of psychologists, psychiatrists, and practical criminologists is a matter of the not distant future.

Kraepelin has published proposals for a research institute in psychiatry: *Ein Forschungsinstitut für Psychiatrie*, (26), giving certain details as to its extent and cost. The institute should have an auditorium, preparation rooms, library, consultation rooms, photographic rooms, and the like, and be provided with a variety of administrative devices. There should be a clinical experimental division, with wards, a chemical department with eight rooms, a sero-bacteriological division somewhat smaller, and a psychological division with nine rooms, from 20 to 30 square meters. A suite for anatomical investigation follows, and a department for demographic and genealogical investigation, with space for registration rooms, for the director, and the statisticians. A department for animal experimentation, including metabolism cages, is necessary. It appears that plans for such institutions have been in part drawn up by an architect, Kollmann, in Munich, the whole to cost 1,307,000 marks. The cost of operation for the scientific investigators is placed at 62,000 marks, and for the various technicians and clerks, 20,600 marks. The nursing service is planned to cost 27,200 marks; the administrative service, 22,780 marks; a sum total of salaries, wages, and labor, of 132,580 marks. Other expenses are counted as: scientific, 37,000 marks; food and drugs, 29,000 marks, general expenses, 69,100; totalling 135,100 marks. The total annual cost would be, therefore, 267,680 marks.

Kraepelin's communication was forwarded in November, 1915, and he states that the realization of his plan is not to be hoped for immediately.

A large work with multiple authorship on diseases of occupation and vocational hygiene, edited by Kober and Hanson (25), contains a number of chapters of psychological interest. On page 765 is a description of the Milan clinic for occupational diseases, written by its director, Professor Devoto. The clinic is in the center of the hospital district of Milan, and contains a great variety of laboratories, including in one institute anatomical, X-ray, chemical, bacteriological, and physiopathological laboratories, including space for the study of experimental fatigue. The clinic cost over a million liras. There are 110 beds. A special and active propa-

ganda of hygiene is carried on amongst the working classes. The chapters on fatigue and upon the occupation neuroses, the former by F. S. Lee, containing some information of psychopathological interest.

Several thick numbers of *Revue Neurologique* are devoted to the neuroses and psychoses of the war. There are elaborate set discussions of special questions, largely of a practical and clinical nature. The majority of studies appear to deal with meningeal and peripheral nervous conditions, with a more moderate number of studies of encephalic lesions. These latter deal chiefly with special neurological questions. Among the neuroses, such questions as those of conscious epilepsy, hysterical euphoria, dream states related to the war, and the like appear. The simulation question is treated by Pitres and Marchand, who show that meningitis, paresis, cerebellar lesions, multiple sclerosis, and tabes, may be imitated. The pension question is also considered.

The special work of the military neurological centers is dealt with (pages 603 to 749, November and December number), following which is an account of a conference of the 15th of December, 1916, in which leading neurologists took part. The reports from Marie's clinic at the Salpêtrière are especially full. Marie and Foix have studied especially synkinesia in hemiplegics. They distinguish from the most frequent form of spasmodic synkinesia a form termed imitative, in which patients attempt to facilitate the execution of movements by the subconscious execution of the identical movement on the other side. Another form of synkinesia is the condensation form so-called, in which the voluntary contraction of certain muscular groups leads to the involuntary synkinetic contraction of muscular groups that are functionally synergic with these. This form of synkinesia tends to reproduce the great synergias that characterize normal life, and accordingly seems to throw into relief the automatism of lower centers. This synkinesia of condensation is an active contraction of associated muscles whose determining cause is, according to these authors, spinal automatism. The spinal cord involuntarily executes those complex movements whose paths have been traced most frequently in the individual and in the species.

Marie and others have studied topographical questions with a particular technique. Babinski's clinic at the Pitié has dealt especially with reflex contractures and paralyses, with hysteria, and with organic paralyses. Babinski maintains that his con-

ception of hysteria (pithiatism) has been upheld by the cases developed in the war.

Laignel-Lavastine deals with the center for psychoneuroses of the Parisian military government, an establishment created by Ballet in 1915. This center has now 550 beds, and at the time of the report eight publications had been made therefrom. Shell shock may run through an initial stage of confusion of various degrees. Organic nervous symptoms may or may not follow. Post-confusional mental phenomena are common. Such are amnesia, dream states, hallucinatory psychoses, depressions, with anxieties, phobias, and the like. Hysterical sequelae may then occur, with a variety of "illegitimate functional manifestations," such as exaggeration, simulation, and the like. Theatrical reactions in certain soldiers are mentioned. There is some simulation of feeble-mindedness or dementia. Decorations are sometimes illegally carried by psychopathic persons. Nervous and mental attacks occurred in certain soldiers upon the occasion of anti-typhoid vaccination. The group of persons recognized by the French as constitutional abnormals are also of importance, to say nothing of the more well-recognized functional disorders, such as hysteria, phobogenic syndromes, and the like. From the neurological center of the third district, second sector (Dr. Francais), come reports on hysterical deaf-mutism and paralyzes, as well as upon the organic effects produced by shells that make no external wound.

The library of the psychologist must be enriched by a number of books, such as Weidensall's *Mentality of the Criminal Woman* (50), White's *Mechanisms of Character Formation* (52), Davenport's *The Feebly Inhibited; Nomadism; Inheritance of Temperament* (12), Glueck's *Study in Forensic Psychiatry* (16), Healy's *Mental Conflicts* (20), besides several translations of works in the psychoanalytic group.

Weidensall's study of the criminal woman is based upon 88 cases examined at the Bedford Reformatory, and their histories were compared with those of 20 college girls, on the one hand, and the norms for working girls in Cincinnati previously worked out, on the other hand. Weidensall says that she thinks that perhaps one woman in five of the prostitute group sent to Bedford would grade up with the better type of saleswoman; perhaps one in four may equal the average housemaid or laundress; but that the remainder, a small majority of all cases, are inferior.

White's *Mechanisms of Character Formation* makes much use

of the theory of Alfred Adler concerning organ inferiority, which however he regards as more a tool of analysis than one of therapeutics. As is always the case with White's work, the various concepts made familiar in the psychoanalytic literature are given a skilful and clear-cut exposition. The richness of the unconscious life and its wish tendencies, the ambivalence in all lives, symbolism, the family romance, the concept of so-called "partial libido trends," the introverted type, the regressive and progressive trends of the libido, are here considered.

Davenport takes us into another field. Although the prime interest in his work is in heredity and the Mendelian variety of heredity studies, yet the work debouches into things of great psychological interest. Nomadism, or the wandering instinct, is "a fundamental human instinct which is, however, typically inhibited in intelligent adults of civilized peoples." Davenport believes that the defective inhibition of this instinct is inherited ("probably a sex linked, recessive, monohybrid trait"), appearing as a rule in males, transmitted through the mother and skipping a generation. Daughters become nomadic, according to these studies, only when the mother belongs to a nomadic stock and the father is also actually nomadic. On the other hand, violent temper is transmitted in another way. This trait is not sex-linked, but is a positive and dominant trait appearing in every generation. Psychologists have commented on the fact that Davenport has here proposed a new instinct, regarding the hunting instinct of James and others as an outgrowth of the wandering instinct. Davenport's study of the inheritance of temperament borrows from the reviewer (who took the terms in turn from Wernicke) the terms *hyperkinetic* and *hypokinetic* for certain temperaments, indicating feeble inhibition. Davenport regards hyperkinesis as due to a loss of normal inhibition, explaining hypokinesis as the result of over inhibition. Partly because of possible confusion in the sounds of the two words (hyper- and hypokinesis), the reviewer prefers to follow Wernicke in contrasting hyperkinesis with *akinesis*. In a communication to be read at the 1917 meeting of the American Psychopathological Association, the reviewer treats, in a more general way and without reference to heredity, the topic of hyperkinesis, pointing out that we are dominated by the scholastic notion of causation (*causa aequat effectum*) to the extent that we often feel that over-activity must be due to something superadded in the organism. The reviewer goes on to point out that "hyperkinesis

by defect" is an exceedingly important variety of overactivity, both in the field of neuropathology and in that of psychopathology. His studies would indicate that the exaggeration of the knee-jerk when cerebral inhibitions are removed by spinal section, is to be subsumed under the same general caption as a great many instances of epilepsy occurring in subjects with brains simplified ("decomplicated") by disease. Akinesis, on the other hand, although it may often be due to the lack of something which would permit the organism to remain a going concern, is also often produced by the excess of something, by something superadded in the organism. In confronting instances of over- or under-activity, the analytical student should consider in turn whether his given example of hyperkinesis is hyperkinesis by defect or by excess; and the same process is of value in the analysis of akinetic phenomena. It appears to the reviewer that the term *hyperkinetic* as used by Davenport, whether or not the heredity studies of Davenport are final, is a term which ought to remain. Under the influence of German psychiatry, practical psychiatrists are of course endeavoring to use the words *mania* and *hypomania* for much which the term *hyperkinesis* much better covers. The more behaviorism comes into its own, the more should we deal in analyses of hyperkinetic and akinetic phenomena, to say nothing of the so-called parakinetic phenomena in which there is neither over-activity nor under-activity from the organism's point of view, but only a perversion of activity, whose purpose and not whose amount is unusual.

Glueck's studies in forensic psychiatry are in the German manner. His cases are interestingly presented, particularly the cases of litigious paranoia, malingering, and kleptomania. The first chapter deals with psychogenesis in the psychoses of prisoners, and gives promise of dealing in a psychoanalytical manner with the whole problem. However, the remainder of the work does not follow this line at all exclusively. The book is written in a very lively and condensed style, and should certainly be followed by numerous others which will give a psychiatric trend to modern criminology.

Healy's book on mental conflicts fails to give a thorough definition of the term *mental conflict*, and the reviewer gathers from personal communication that Healy regards such definition as not particularly necessary. In the reviewer's opinion, however, the fundamental nature of psychomachy has not been made clear. The most concrete analogue which the specialists in so-called mental

conflicts can bring is the Sherringtonian notion of competition in innervation of antagonistic muscle groups. It is a pretty far cry from the competition between extension and flexion to intrapsychical conflicts. It is to be hoped that psychiatrists will in future try to give an exact definition of mental conflicts. Meyer, in a review of Glueck's book, speaks of an "analytic psychodynamic interest" that is more and more characteristic of American psychiatry. Nothing is more the cynosure of every psychodynamic eye than mental conflicts. The science of psychomachology ought to be laid down on solid ground. Up to date, we have little more than ethical theories, such as would be quite within the range of understanding of eighteenth century moralists.

Last year a review was presented of Hinkle's translation of Jung's *Wandlungen und Symbole der Libido*, somewhat puritanically translated as "the psychology of the unconscious." The war has prevented much Austrian progress in the Freudian and allied doctrines, and here in America we are somewhat breathlessly catching up with the situation in a succession of translations. Brill has translated Freud's *Wit and its Relation to the Unconscious*, following his translation of *Selected Papers on Hysteria and Psychoses* (1912), *Three Contributions to the Theory of Sex* (1916), *The Interpretation of Dreams* (0000), *Psychopathology of Everyday Life* (—). It appears that translations of further works of Freud, notably *Totem and Tabu*, are in preparation.

A valuable book is the translation by C. R. Payne of Pastor Pfister's book (32) on the psychoanalytic method, published originally in 1913. Pfister remarks that criticism hostile to analysis (the psychoanalysts commonly refer to *psychoanalysis* as *analysis*) suffers from a fatal disease which he calls ontophobia, or fear of the facts. This author, like many other psychoanalysts, constantly refers to the repulsion which many workers at first feel to psychoanalytic "facts." It has been the reviewer's experience, however, that various students of his acquaintance feel no repulsion whatever to the so-called "facts" and slip into implicit and thoroughgoing belief in the Freudian interpretations as "facts" altogether too easily. There is something which deserves only the term hugger-mugger about this line of critique of the opponents of Freud. We must concede at least this measure of ingenuity to the Freudian propaganda, namely, that hardly any other propaganda has dared to say that initial disbelief in the doctrine is an argument for the truth of the doctrine. On the whole, this book

of Pfister, while not the product either of a physician or of a psychologist, appears to be one of the best of all the expositions of Freudism.

A somewhat unsatisfactory section on the psychoanalytic conception of the unconscious (referring very summarily to a few German authors) is followed by more careful study of repression and fixation processes, and the concept of retrogression. Part 2—pages 429 to 580—deals with the technique of psychoanalysis, including abreaction, compensation, transference, details of educational work, special field of pedanalysis, and the results of psychoanalytical treatment. Pfister (page 513) decries the use of psychoanalysis as a social sport, and believes that the true psychoanalyst can enter his work only in a state of earnest and exalted responsibility. Women are perhaps better psychoanalysts of the first years of childhood than men. "An analyst who believes himself persecuted, is unhappy in love, or morally uncertain, would be in an extremely difficult position and would do better, if he does not possess extraordinary self-control, to interrupt his analytical work until his personal relations are arranged" (page 517). Should this dictum of Pfister be followed with respect to the matter of feelings of persecution, it would appear that a good many modern practitioners in psychoanalysis would have to cease their work. It seems that much of the mutual criticism of Freud and Jung falls little short of ideas of mutual persecution.

Freud's familiar work on Leonardo Da Vinci (15) has also been translated by Brill. Leonardo was an illegitimate child, who, without a father, "surely must have entered into a phase of infantile sexual activity," etc.

Under the title "Analytical Psychology," various papers of Jung (24) have been translated by Dr. Constance E. Long of London, who rightly states that we just at present need a "new philosophy of life to take the place of that which has perished in the general cataclysm." Dr. Long goes so far as to see in Jung's analytical psychology based upon "a scientific study of the unconscious, the germs of a new construction." Jung himself contributes from Zürich a preface, in which he states that the Vienna school (that of Freud) takes the standpoint of an exclusive sexualistic conception, while that of the Zürich school is symbolistic. The Vienna school, according to Jung, interprets the psychological symbol as a sign of certain primitive psychosexual processes. The Zürich school admits that one may thus interpret symbols

upon an exclusively sexual basis, but denies that the Viennese point of view is the whole truth. Symbols for Jung have not merely a semiotic value but a positive value, "for to the Zürich school the symbol is not merely a sign of something repressed and concealed, but is at the same time an attempt to comprehend and to point out the way to the further psychological development of the individual." Symbols are not merely retrospective but prospective. Whereas Freud is merely analytical and devoted to the discovery of causes, Jung claims to be synthetic and prospective, dealing with the future aims of the human mind. Freud, Jung hints, is a hedonist, a scientific materialist; whereas the psychology of power and the corresponding philosophy of Nietzsche are to be preferred. According to Jung, the principles of Adler are opposed to those of Freud, being founded not upon a hedonistic principle but upon the principle of power. As for Jung, he regards the hedonistic views of Freud and the Nietzschean principle of Adler as equally one-sided. To be sure, a given example of diseased mental attitude may perfectly illustrate either the Freudian or the Adlerian psychology, according to whether the patient's difficulty revolves about his sexual desire or his desire for power. Within the limits of a given case of inner dissociation neuroses, the Zürich school is perfectly willing to reduce the phantasy products of a patient to a fundamental infantile hedonism, on the one hand, or to a fundamental infantile desire for power, on the other. For Jung, the fundamental thoughts and impulses of the unconscious are symbols indicating definite lines of future development. To be sure, there is "no scientific justification for such a procedure." "Psychology essentially cannot be exhausted by causal methods only, because mind lives by aims as well." The real argument for the Zürich position, according to Jung, is the argument for vital necessity, for "it is impossible to live according to the intimations of infantile hedonism, or according to a childish desire for power. If these are to be retained, they must be taken symbolically." Along such lines, Jung seeks to evolve the truly philosophic or religious attitude. Newer and newer symbols take the place of the old. A new symbol may lead to "constructive truth." In the unconscious when we probe it, according to Jung, we find instead of modern symbolism, an antiquated, archaic view of the world and life.

The book itself contains translations of papers on the psychology and pathology of so-called occult phenomena, the association

method, as well as the more pronounced psychoanalytic papers of Jung. The father complex, enuresis as a sexual surrogate, the significance of number dreams, are taken up. There is an interesting criticism (chapter 6) of Bleuler's theory of schizophrenic negativism. The fluidity of terms is emphasized by the fact that Jung seems to identify schizophrenia with psychoneurosis (page 205). According to Jung, the autism of Bleuler (withdrawal into one's own phantasies) is precisely the autoerotism of Freud, and is what Jung had previously termed the overgrowth of the phantasies of the complex. According to Jung, Bleuler's negativism runs as follows: *a*, the autistic retirement of the patient into his own phantasies; *b*, the existence of a life wound (complex) which must be protected from injury; *c*, the misconception of the environment and of its meaning; *d*, the directly hostile relation to environment; *e*, the pathological irritability of schizophrenics; *f*, the "press of ideas" and other aggravations of action and thought; *g*, sexuality with its ambivalency and emotional plane, often one of the roots of negative reactions. Jung believes that the so-called resistance is at the bottom of the negativism. Thus, one's withdrawal into his own phantasies is coincident with an increase of resistance. In point of fact, one's autistic retirement is identical with the existence of one's complex; at least, the existence of the complex and the occurrence of the egocentricity are reciprocals of one another. If you have a life wound, or so-called complex, this life wound of necessity calls for autism (autoerotism, introversion). Again, misconception of and hostility to the environment are incidental to resistance, and the irritability of schizophrenics is due to nothing but a damming up of the affect (that is, a damming of the libido) that ensues upon increased resistance. Neurasthenia being a classical example of such damming up of affect, is accordingly not different from schizophrenia. (Of course, psychiatrists in general would be loath to grant that neurasthenia is at all identical with schizophrenia; but Jung would probably say that non-institutional cases of schizophrenia are often nothing but neurasthenia.) As to the press of ideas and paralogic of the thought processes of the schizophrenic, Jung believes that the "painfulness of the elaborated complex necessitates a censorship of its expression." Not only are neurasthenia and other psychoneuroses identical with schizophrenia, but if you pay deep and concentrated attention to something, you may conjure up ideas "as like as two peas to the phantasies and expressions of schizophrenia." When this article

was written, Jung held that resistance always springs from a peculiar sexual development, and Jung was at this time disturbed by the views of Bleuler, who would allow to sexuality only a "quasi determining influence on the phenomena of negativism." In a contribution to the study of psychological types (1913), however, Jung characterized hysteria as illustrating a centrifugal tendency of the libido, whilst in dementia præcox the tendency is centripetal. However, the centripetal tendency of libido is soon hampered in actual life and forced to regress; the victim of dementia præcox, at first self-withdrawn, later may become extravagantly aggressive. Extraversion and introversion are the terms chosen by Jung for these two tendencies of the libido. "We say that he (the patient) is extraverted when he gives his fundamental interest to the outer or objective world. . . . He is introverted, on the contrary, when the objective world suffers depreciation . . . for the sake of the exaltation of the individual himself who . . . grows to believe no one but himself worthy of consideration." Jung wishes to term regressive extraversion the phenomenon called by Freud transference, in which the hysteric projects his illusions into the objective world. He wishes to term regressive introversion, the characteristic process in dementia præcox, in which the subject himself undergoes phantastic transfiguration. According to Jung, who in several places exhibits evidence of considerable acquaintance with James, the James distinction of the tough-minded and the tender-minded is quite in accord with the spirit of psychoanalysis. Thus, the tough-minded of James are the extraversionists of Jung; and the tender-minded of James are the introversionists of Jung. The classicists and romanticists are these same extraversionists and introversionists once more. Jung ascribed to Nietzsche a similar contrast between the Apollonians and the Dionysians. The contrast at bottom is that between a dream and an intoxication. In the dream, the individual is shut up as in introversion; in intoxication, extraversion takes place. Within the field of psychoanalysis itself, Jung points out the centrifugalist, Freud, and the centripetalist, Adler. Freud's theory is essentially pluralistic, causal, sensualist, empiricist; Adler's theory is philosophical, finalistic, teleological. As Freud's typical patient seeks centrifugal satisfaction by infantile transference, projecting phantasies into objects and transfiguring them, so Adler's typical patient provides safeguards for himself in the "virile protest" in an affirmation of dominating ideas. It is in this chapter (II), that we perhaps see the first striking evidence

of the split which was to come between Jung and Freud. A further chapter on the psychology of dreams, prepared for the Berne Medical Congress of 1914 but postponed on the outbreak of war, maintains that the value of dream symbolism varies according to whether you adopt the Freudian standpoint of causality or the Adlerian standpoint of finality. According to Freud's causal viewpoint, it proceeds from a craving, namely, from the suppressed dream wish, which dream wishes are able to disguise themselves under manifold forms. Long objects dreamed of, for the Freudian school, are phallic symbols. On the other hand, from the viewpoint of finality, different dream pictures have different and peculiar values. Diversity in the dream's mode of expression is extremely significant. For the practical development of the individual, the finality viewpoint, according to Jung, is singularly important, despite the fact that the causality viewpoint seems at first sight more scientific. On page 288 occurs a footnote, apparently by the translator, as follows:

"In Freud's writings, the term 'libido' has always a sexual meaning. But it is well known that Jung has restored to this term its classical meaning of desire or passion in general. He has pointed out recently that we might, following Claparède's proposal, translate it by the word 'interest.' We have preferred in the present translation to keep to the term 'libido' to express the instinctive psychological effort, the *élan vital*, the joy of living, the fundamental interest of the individual, etc."

Adler's book (2) on the neurotic constitution has been translated by Glueck and Lind. The considerations go back to a study on the inferiority of organs, published in 1907, wherein Adler thought that he had discovered "a remarkable relationship between somatic inferiority and somatic psychic over-compensation." The fundamental viewpoint of Adler is, accordingly, that "the realization of somatic inferiority by the individual becomes for him a permanent impelling force for the development of his psyche. Philosophically there results from this a reinforcement of the nerve tracts, both qualitatively and quantitatively, whereby a concomitant inferiority of these tracts is enabled to reveal in a composite picture its tectonic and functional pictures." By psychological investigation and analysis, one may disclose the psychic phase of these compensatory and over-compensatory processes. Adler is thus dealing with a kind of relationship between organic and psychic disease states. There are many examples in the medical literature

of such relationship; for example, the asthenic habitus; Ponfick's exudative diathesis; Heubner's lymphatism; and the Hess-Eppinger vagotonia, to give only a few examples. According to Adler, "the inferior organs constantly endeavor to make a very special demand upon interest and attention." Inferiority of an organ "constantly shows its influence on the psyche in action, in thought, in dreams, in the choice of a vocation, and in artistic inclinations and capabilities." For example, "A defective digestive apparatus will be accompanied by a greater psychic capability in all nutritional directions, as gourmandism, acquisitiveness, stinginess, and greed."

The book contains many references to the craving for security (*Sicherungstendenz*), on the one hand, and the masculine protest (*Männliche Protest*), on the other. Thus (page 99), the neurotic's striving for security can only be understood when the original contrary factor, his uncertainty, is considered. "In the analysis of psychoneuroses it always becomes obvious that this antithesis resolves itself in accordance with the only real 'antithesis of man—wish' so that the feeling of inferiority, uncertainty, lowliness, effeminacy, falls on one side of the table; the antithesis, of certainty, superiority, self-esteem, manliness, on the other. The dynamics of the neuroses can therefore be regarded . . . as if the patient wished to change from a woman to a man. This affect yields in its most highly colored form the picture of that which I have called 'masculine protest.'" Numerous elaborations of these ideas appear. For example (page 406), homosexuality "is the result of the fear of the opposite sex."

Poul Bjerre presents a book (6) on history and practice of psychoanalysis, Chapter 7 of which contains a long extract from a case history in which Bjerre was successful in "dissolving analytically a strongly constituted system of persecution of 10 years' standing, and in giving the patient (an unmarried woman of 53 years of age) complete comprehension of her illness." The book starts with Kant's fixation of the fundamental fact of psychotherapy from his attacks of gout. It was his book on the power of the mind through simple determination to become master over morbid ideas which crystallized in von Feuchtersleben. A chapter on Wetterstrand and the Nancy School follows; after which the development of psychoanalysis is taken up. This book, favorable to the cause of psychotherapy, and in general favorable to psychoanalysis, forms one of the most amiable and welcoming of all the books of this group.

The collected contributions, Third Series, 1915, from the Massachusetts State Board of Insanity and the State Institutions for Mental Disease and Defect contain various papers on mental tests; for example, a programme and directions for mental examinations of asocial, psychopathic, and doubtful subjects (Hardwick (19)), mental tests and social status (Yerkes and Anderson (54)), two psychological studies of criminals, Rossy (38, 39). The reviewer (45) has attempted to show that histology may prove of some service in getting at the mechanism of certain cases of hallucination, and in another paper (46) gives some data concerning delusions of personality, with a note on the association of Bright's disease and unpleasant delusions. When this latter paper was first presented at a meeting of the American Psychopathological Association, Jelliffe suggested that it might have some relation with the Adlerian concept of organ inferiority.

Myerson (29) presents an interesting analysis of hysteria as a weapon in marital conflict. Myerson (30) also presents a careful review of the conditional reflex theories of Pawlow.

Interesting speculations as to the difference between carnivorous and herbivorous types are presented by Bryant (8).

The American neurological and psychiatric literature contains some papers of psychological interest. From the *American Journal of Insanity* may be mentioned Prof. Pierce Butler's (of Tulane) address (10) to the American Medico-Psychological Association on stage-mad folk in Shakespeare's day. Rosanoff (37) deals with the old question of the relationship between genius and insanity. William Cowper is described as pretty certainly a manic-depressive, and some of his verses would never have been written, according to Rosanoff, if Cowper had not been insane. Mayer, the discoverer of the law of the conservation of energy, is another manic-depressive. Flaubert is described as an epileptic. Burr (9) describes pictorial art of the insane as very largely emotional, frequently erotic, often subtly symbolic.

Another article, in part a translation, by Beryl Parker (31), on the psychographs of Rossolimo, details a method of securing so-called psychic profiles characteristic of various forms of disease and other conditions. These graphic profiles deal with attention, will, perception, memory, comprehension, construction, mechanical sense, imagination, and observation.

In Myerson's 132-page article (28) entitled, "Psychiatric Family Studies," he appears to show that paranoid conditions in

the ancestors breed dementia præcox in the descendants. Again, though not so clearly manic depressives are followed by manic depressives. Should these conclusions be maintained, clearly a study of mental traits in normals, or apparent normals, would be of the greatest importance. On account of the difficulty of evaluating the normal mentality of the senile period it would appear that much psychological work might well be done in this field. Incidentally, Myerson believes that "all roads seem to lead to dementia præcox, and from thence to imbecility." No genius and no high-grade talent has appeared prominently in any of the family groups studied, despite the fact that these groups appeared in a district from which talented persons have spread out.

Farrar (13) presents observations upon the Canadian expeditionary force. Farrar states that severe war neuroses may perhaps develop in quite normal persons; at least, competent observers have so asserted. Farrar considers that the concept of normal is so elastic that we may never get a definitive answer to this question. At all events, the majority of severe war neuroses occur in persons where there is evidence of "psychopathic potential." Exhaustion and fatigue do not appear to have causal importance with respect to the neuroses or psychoses. Aside from accidental diseases, there is a reactive group of psychoneuroses. Among these are anticipatory neuroses and trench-neuroses, the type of which latter is shell-shock. The trench neuroses occur as a rule in unwounded soldiers; in fact, some persons believe that on the basis of contemporary military experience, we should give up the concept of so-called traumatic neuroses. On the whole, the war neuroses are probably psychogenic.

From the *Journal of Nervous and Mental Disease* for 1916, may be mentioned the reviewer's paper (44) on mental symptoms in paresis, according to which paper, cases with mild lesions were the most hyperkinetic and difficult to handle. They were far more apt to show resistiveness, violence, destructiveness, refusal of food, and delusions concerning the environment. On the other hand, the cases with most marked atrophy, as a rule of the frontal region, were those which seemed the happiest, tending more to euphoria, exaltation, or expansiveness, than did the others. Another curious result of this study was that such symptoms as amnesia and dementia did not appear to be more frequent in cases with severely injured brains than in those with milder injured brains, a finding which possibly indicates that much of the picture of grave deterioration in general paresis is functional.

Bronner (7) pleads that physicians should know something of general and applied psychology, pointing out certain errors on the part of more or less prominent psychiatrists. Schmitt (40) pleads for coöperation between psychologist and physician, pointing out the failure by family and teachers to recognize high-grade types of mental defect, the frequent lack of recognition of sensory defects, the occurrence of special interests leading the child to deviate from conventional social life, and certain cases of diffidence.

An interesting paper by James J. Putnam (35) upon acroparesthesia abounds in reference to the causal nature of neuroses, and speaks clearly and consciously of changes of point of view in 40 years of observations, with a general tendency to a more functional point of view.

J. J. Thomas (49) describes neurological cases seen at a base hospital.

The *Journal of Nervous and Mental Disease* presents translations of Higier's vegetative neurology (21), a continuation of a translation of Maeder's dream problem (27).

Interesting psychopathological papers appear in the *Journal of Abnormal Psychology*. The term *abnormal* is broader than the term *psychopathological*, since, for example, geniuses would be included under the head of abnormal. This well-known journal excludes ordinary clinical psychiatric material. Brief mention may be made of an elaborate study of quintuple personality by Walter Franklin Prince (33); papers on dreams by Horton (22, 23); studies by Meyer Solomon (42, 43); a paper on the utilization of psychoanalytic principles in the study of the neuroses by Putnam (36); and one upon dementia præcox and the infantile mode of reaction by Douglas Singer (41). Singer regards as the most characteristic dementia præcox reaction the substitution of dream phantasy for reality. Dementia præcox is not truly an arrested development, but is a development along faulty lines.

Grabfield (17) presents a study of variations in the sensory threshold for faradic stimulation in psychopathic subjects, being the method devised by Prof. E. G. Martin and systematically employed in the admirable alcohol studies of Dodge and Benedict. Grabfield finds expression the normal sensitivity in a case of traumatic neurosis and in certain cases of occupation neuroses.

Haines (18) presents a somewhat elaborate analysis of the genesis of a paranoic state, analyzing the case from a variety of points of view, such as those of Bleuler, Meyer, and Kraepelin.

Haines queries how far the psychopathic tendency in this case could be corrected by what he calls mental orthopedics (a term reminding one of a term proposed by H. M. Adler: *orthopsychics*).

The proceedings of the American Psychopathological Association's seventh annual meeting (34), held at Washington, May 11, 1916, are presented in the February-March number of the *Journal*. The main feature of the programme was a symposium on dementia, in which perhaps the most suggestive communication was by MacCurdy on epileptic dementia.

The Psychological Clinic, aside from the usual array of papers on feeble-mindedness and tests, contains some work of directly pathological interest. Witmer (53) presents a paper on congenital aphasia and feeble-mindedness. It appears that there are some persons that have what may be called congenital aphasia or alexia, who are precisely with respect to speaking and reading in a position of persons without ear for music, who therefore would be examples of congenital amusia. Persons with such specialized defects are of course proper subjects for special classes.

Bisch (5) presents in the May number (1916) of the *Journal of the American Institute of Criminal Law and Criminology* an account of a police psychopathic laboratory, detailing some experiences from the City of New York.

Of some interest to psychopathologists is a portion of an article by the reviewer and Canavan (47) on finer cortex changes in dementia præcox. The earlier German claim based upon preliminary observations by Alzheimer, that the cortex changes in dementia præcox, particularly in catatonia, were in the deeper layers of the cortex, has now been reversed. It is now thought to be better established that the upper layers of the cortex bear the brunt of such changes. The histological work of the paper above mentioned deals with technical questions, but in the body of the paper is presented a brief analysis of the functional probabilities concerning what may be termed the supra-cortex and the infra-cortex respectively. On the whole, the reviewer felt that such phenomena as hallucinations and catalepsy were related to disease of the lower layers, but that schizophrenic effects, such as are shown in paranoid cases of dementia præcox, are to be related more with disorder in the supra-cortex; that is, in the more recently involved portion.

E. Stanley Abbot (1) presents a paper on the mechanism of paranoia, concluding that paranoia stands nearest in the normal life to prejudice.

In a paper on the application of grammatical categories to the analysis of delusions, the reviewer (48) calls attention to the value of attempting to express the relation between the world and the individual from the individual's point of view. From the point of view of the individual, the self is either active or passive in relation to the environment, and in any given case of behavior this self-activity or self-passivity is as a rule demonstrable because the organism is polarized in one direction or in the other. But the so-called reflexive or middle voice of grammar also finds its analogue in the mental life, seeing that almost equally important to the individual are his relations to himself. Once more the reflexive relations of the self break out into a group in which (to use the expressive terms of James) the *I* dominates the *me* and the *me* dominates the *I*. Another suggestion concerning the nature of delusions is derived from the grammar of the moods. The reviewer feels that we may distinguish pragmatic delusions from phantastic delusions; the former are such delusions as are not *prima facie* absurd and whose truth or error can be determined only by recourse to the facts or through the passage of time. Phantastic delusions are *prima facie* in the given context absurd. The pragmatic delusions are somehow precipitations of an *if* or a *since*; phantastic delusions are, as it were, precipitations of a *would that*. It may be that human characters in general are determined along these two lines. Perhaps indeed, the distinction corresponds to the familiar one of James: between the tough-minded and the tender-minded.

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SPECIAL REVIEWS

Wit and its Relation to the Unconscious. S. FREUD. (Trans. by A. A. Brill.) New York: Moffat, Yard, 1916. Pp. vii+388.

When Freud's work on wit was published in 1905, his psychology was not as well known to English-speaking students as it is now, and the book was ponderous and forbidding. An epitome of it fifty pages long was given by Brill in 1913 in the last chapter of his "Psychoanalysis." But although reference is made to it occasionally

in the literature, it is safe to say that the book is still relatively unfamiliar, so that the present translation is likely to prove useful, and perhaps even the following report.

The whole work is divided into three parts, entitled respectively Analysis, Synthesis and Theory. The first part contains an Introduction in which the author surveys current theories and finds them wanting; various attributes and criteria are given, but they are not organically connected, we do not know whether all must be applied, or only some of them. Freud seeks an organic point of view, and this is one, and probably the greatest, merit of his undertaking. Apart from this Introduction each main division of the work subdivides into two chapters. Analysis treats of the technique and the tendencies of wit; synthesis of its pleasure mechanism and its motives; theory of its relations, first, to dreams and the unconscious, and, secondly, to forms of the comic. The work is thus systematic, and it is fairly long, a treatise, not an essay.

Freud begins with examples. His method is inductive. His collection of *facetiae* is extensive and varied. He aims to include every kind of wit and succeeds, he believes, in including at least all the commonest and most important kinds. There is room for difference of opinion as to the degree in which some of the stories and sayings given are "really" witty, for the German *Witz* does not seem to correspond exactly to the French *esprit*, or to all the varieties of meaning of the English "wit," and each age, as well as each country, has its own standards and preferences. On the whole there is little to complain of in Freud's selection on the score of comprehensiveness. Much in this part of the work is highly entertaining. On the other hand, the explanatory analyses seem at times needlessly prolix, as when, for example, seven pages are taken up with the elucidation of a story the quite obvious point of which lies in the use of the portmanteau word *famillionnaire*. The result of the investigation into the technique of wit is the discovery that the chief category of word-wit is condensation, and that in all its forms it exhibits a tendency to economy; that thought-wit is characterized by displacement and substitutive formations, such as faulty thinking, indirect expression, absurdity and representation through the opposite; and that, consequently, the mechanism of wit bears a striking analogy to that of dreams.

In the next chapter analysis deals with the distinction between harmless, or abstract, wit and tendency-wit, that is, wit in the service of a purpose. The former is held to be more instructive for

the explanation of the nature of wit, the latter, however, is especially important for the light that it throws on the pleasure-producing mechanism of wit. Freud distinguishes four main kinds of tendency-wit, the obscene, the hostile, the cynical and the skeptical, each of which he subjects to careful and interesting analysis. The important conclusions are, first, that the enjoyment of wit depends on its technique, and, secondly, that it depends on its tendency. The problem then is, in what point of view can these utterly different sources of pleasure be united? With this question we pass from analysis to synthesis.

The solution of the problem is found in the conception of "economy of psychic expenditure." We recall that a tendency to economy was discovered as the characteristic feature of the technique of word-wit; we now observe that economy is the source of pleasure in all wit. The case is clearest in tendency-wit. Here the principle of economy is seen at work in the evasion by means of the wit of hindrances, external or internal, to the expression of the tendency. Impulsions whose direct expression at the present stage of civilization would entail unpleasant consequences are psychic energy which is no longer required when the impulsion is repressed; but repression, inhibition, involves an expenditure of satisfied in a form which avoids the unpleasant consequences. The secret of the pleasurable effect of tendency-wit, then, lies in "economy in the expenditure of inhibitions or repressions." But the same principle applies also to harmless wit. Here there is relief from the higher demands of reason. Wit as to its technique appears as an inferior achievement of mental activity. In certain forms of harmless wit we find the same play on words, the same following of external associations, that we meet with in abnormal patients and in children. In others with a different technique pleasure arises in recognition of the familiar. Outside of the wit-work this inferiority may excite displeasure. The peculiarity of the technique of wit lies in the safeguarding of this source of pleasure against the protest of reason. From this point of view Freud suggestively indicates the process of the genesis of wit through play and jest to the most subtle forms of tendency-wit. It now appears that the pleasure in the latter is enhanced by a double economy; there is the "fore-pleasure" due to the economy of the technique of the wit which serves to escape the repression, and there is the pleasure due to the economy in the release itself.

This brings us to the motives of wit. Besides the pleasure-

motive, there are others, some hard to discover, and Freud devotes a good deal of space to their elucidation. But we need not follow him here. The essential point is that wit is a social process. No one is satisfied to make wit for himself alone; he desires to impart it. In imparting it he causes inhibition to become superfluous in the hearer; the repression is discharged in laughter. The principle of economy thus appears in a new light. The original pleasure was derived from simple economy of expenditure, but with the development of play into wit the tendency to economy shifts its goal. New and increased sources of pleasure are opened up. The case is analogous to that of the business man who, having but a small trade, makes his expenses small, but increases them, if the returns are sufficiently large. So here. A localized economy may give rise to a momentary pleasure, but there is no lasting satisfaction if the saving can be utilized elsewhere. By being shared the local expenditure is transformed into a general alleviation. The pleasure in the first instance was due to the removal of an inhibition; it finds satisfaction, and the movement comes to rest, only when, by the intervention of the third person, there is general relief through discharge.

With the conception of wit as exhibiting economy in the expenditure of psychic energy, we enter upon the final form of the theory, the relation of wit to dreams and the unconscious. We have already learned that wit resembles dreams in its technique; we now learn that it resembles them in its formation. The process according to Freud—we have to bear in mind his doctrine of the three levels of the psychic—is this: a preconscious (“fore-conscious,” in the translation) thought is left for the moment to unconscious elaboration, and the result is forthwith grasped in conscious perception. Wit is an inspiration. This recourse to the unconscious is at the same time a recourse to the infantile, in which also Freud finds the origin of dreams, and we thereby regain possession of childish sources of pleasure. The reference to the unconscious is seen most clearly in cynical wit. But introspection shows that in other cases also the choice of words is not made by conscious attention and is the better if “the occupation energy of the fore-conscious is lowered to the unconscious.” Freud admits that his hypothesis is not proved; we know as yet too little about the unconscious; this is still virgin soil. Nor is it likely that he would have hit upon the hypothesis but for his previous study of dreams; but that can, of course, be no objection. He is careful, moreover, to

point out the differences between wit and dreams, as well as their resemblances, the most important being that, while dreams are "asocial," wit is of all the psychic functions aiming at pleasure the most social. Finally, after discussing in a separate chapter the relation of wit to the comic, he sums up his whole doctrine as follows: "The pleasure of wit originates from an *economy of expenditure in inhibition*, of the comic from an *economy of expenditure in thought*, and of humor from an *economy of expenditure in feeling*. All three activities of our psychic apparatus derive pleasure from economy. They all strive to bring back from the psychic activity a pleasure which has really been lost in the development of this activity. For the euphoria which we are thus striving to obtain is nothing but the state of a bygone time in which we were on state defray our psychic work with slight expenditure. It is the tow of our childhood in which we did not know the comic, were incapable of wit, and did not need humor to make us happy."

The theory is certainly "organic," and as a point of view valuable. Whether the reference to the unconscious takes us far may be doubted; the unconscious may be regarded as a deposit of the infantile, it may also be regarded as the source of the creative energy of the universe. The crux of Freud's position is his conception of psychic energy. His construction rests on the assumption that the amount of psychic energy expended in the wit which evades a restriction is less than that required to maintain the inhibition. If this assumption is false, the whole construction goes to pieces. What, then, is the evidence for it? The answer is that there is none, at least none that is convincing. And the reason is that we have no means of measuring and comparing amounts of psychic energy. This is not to deny elements of truth in Freud's application of the principle. There certainly is pleasure in release of tension, and there is no reason to doubt that this is one of the sources of pleasure in wit. But when we go from theory to experience, we find all sorts of differences in the activity that goes both to the making and to the appreciation of wit. Some are witty without knowing it; some are quick-witted, others slow-witted; some wit is ready, other wit labored; some wit bubbles up like sparkles in champagne, some is like the brilliancy of precious stones cut and polished with art and care. And so with appreciation. The flash of recognition must indeed be immediate, for surely one of the chief sources of pleasure in wit comes from surprise; but it is not always easy to detect the hidden meanings, the subtle allusions, and to enter fully into

the higher, more intellectual, forms of wit, requires preparedness and concentration. Who shall say whether in a given case more or less energy is demanded to maintain an inhibition which has become habitual, and therefore is not burdensomely felt, or to circumvent it by an unusual intellectual elaboration?

The translation leaves much to be desired. "Fore-pleasure" and "fore-conscious" are literal, but hardly satisfactory, renderings of the German equivalents, "others as" for "other than" (p. 56) perverts the sense, and familiar as we are with "the unconscious," we are hardly yet prepared to admit the operations of a man's "unconscious." And the English in other respects is no better than it should be. We smile at "preponderately" (several times; not, therefore, a misprint), shrug our shoulders at "not much different than," but when we come on such a sentence as, "Like the comic the naïve is found universally and is not made like in the case of wit" (p. 290), we shudder and protest. H. N. GARDINER

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The Effect of Humidity on Nervousness and on General Efficiency.

L. I. STECHER. Arch. of Psychol., 1916, No. 38. Pp. v + 94.

Many casual and uncontrolled observations have been incorporated into scientific discussions because of tradition. The effects of weather conditions are among this great number. It has been believed that certain kinds of weather make corns ache, cause rheumatic pains, prevent good mental and physical work, and give rise to depressions or excitements. The present study shows that as far as the experimental conditions have gone there is no warrant for the conclusion that humidity (20 and 50 per cent.) has any special effect by itself in changing the efficiency of the subjects who were used. The author rightly remarks, however, "that individuals put under certain controlled conditions react or fail to react in certain ways is by no means to be taken as saction for all sorts of uncomfortable ventilation conditions." It is possible, although there is no scientific demonstration of this, that the combination of long-continued humidity, foul air, heat, and perhaps other conditions, may bring about a considerable lowering of efficiency which is not to be determined for any one condition by itself. And, the author concludes that if the effects of long-continued conditions which have been thought to be adverse are to be found it is for physiology to trace these "subtle, long-time ill-effects."

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DISCUSSION

THE MEASUREMENT OF INTELLIGENCE

The recent revision by Terman¹ and his collaborators of the Binet-Simon tests of intelligence has increased the reliability of this method of estimating intelligence and has led to findings of value and of general psychological interest. The revision has involved the examination of approximately 2,300 subjects, but is based on the results of about 1,000 "unselected" cases. The results are stated in terms of "intelligence quotients," which is the name given to the ratios of the "mental" ages (determined by standing in the tests) to the chronological ages of the individuals tested. The distribution of these quotients about their medians is approximately symmetrical at each age from five to fourteen, and the range which includes the middle fifty per cent. of the quotients is found practically constant from 5 to 14 years. From this latter fact the author concludes that "the traditional view that variability in mental traits becomes more marked during adolescence is here contradicted." The actual deviation in months and years (*i. e.*, the gross variability as distinguished from the relative variability which the quotients measure) does, of course, increase with age, and in this sense, children of the adolescent period differ more from each other than children of earlier ages. The questions upon which the extent of variability really depend are: whether or not the increments in mental growth are greater in this period than in the years which precede or follow it, and whether or not the incidence of this added growth impulse comes at such different times in individual cases as to increase the range or extent of individual differences of the period. Both of these questions have been answered affirmatively in studies of the increments of physical stature; and, since there is in general some parallel between bodily and "mental" growth, it has seemed reasonable to anticipate that the same facts would hold for the latter also. It seems probable that the author's results are open to the same statistical error as marked the earlier studies of physical growth, namely, that they are based on averages of different groups of individuals. Wisslar²

¹ *The Measurement of Intelligence*, L. M. Terman (intro. by E. P. Cubberley). Boston: Houghton Mifflin Co., 1916. Pp. xii + 362.

² *Am. Anthropol.*, N. S., Vol. 5.

and Baldwin¹ have shown the necessity of having repeated measurements on the same individuals to determine the facts in regard to the yearly increments in stature. The formerly accepted averages concealed the real extent of variability as they probably also do in this case.

Girls are superior to boys in the tests up to the age of thirteen, but the superiority is slight, amounting at most ages to only 2 or 3 points in terms of the intelligence quotients. Studies in physiological development would have led one to expect greater differences between the sexes.

The intellectual status of an individual in relation to his fellows appears to remain fairly constant during the period of growth. Retests of the same children at intervals of two to four years support this conclusion. In this case the finding is paralleled by the studies of increments in physical growth. Children who are taller than the average in early years tend to maintain the superiority throughout the later years. This gives the striking "railroad" appearance to the charts of individual growth, and indicates that, if the relative position of a child in relation to the average at any given age is known, it is possible to prophesy in the large majority of cases very accurately the height to which the child will grow. It now appears that a similar prophecy can be made in regard to intellectual development. This conclusion has also been indicated by studies of the present writer and his students² which have shown that in a large proportion of cases children maintain the same relative rank in school studies from the elementary school through the high school and college.

Individuals whose intelligence quotients fall below .70 should, according to Terman, be considered feeble-minded. This, while perhaps safe enough as a standard, should always be supplemented by other commonly accepted criteria.

The method adopted for selecting and placing the 36 new tests which are added in this revision is open to some criticism in that it tends to narrow the tests of "intelligence" to closely related abilities. In this connection the much higher correlation of the Binet tests with language and reading tests than with mechanical construction tests found by Thorndike³ is significant. The inter-correlation of the tests in any age group affects the percentage of

¹ U. S. Bur. of Ed., Bull. No. 10.

² Cp. *School Review*, May, 1913.

³ *Psych. Clinic*, Vol. 10, No. 8.

passes which may be taken as standard for a given test as well as the reliability of the median mental age so determined, as has been pointed out in a penetrating article by Truman Kelly.¹

In assigning six tests for each year and counting each test passed as two months in the computation of the total mental age, the assumption is tacitly made that the increase in intelligence in each yearly period is on the average approximately equal. The average or median yearly increment in intelligence becomes the real unit of measurement. Burt² has challenged the correctness of this assumption, and has asked whether anyone would think of measuring physical growth in this way. The comparison is illuminating. It is possible to measure growth in physical stature with considerable accuracy in just this way, since the *average* of yearly increments in stature is sufficiently constant, for at least the years under consideration, to be used as a unit. Yerkes has also "rejected" this method, although he has advanced no evidence for his *ipse dixit* that "the age arrangement of tests is wrong in principle violating the laws of mental development."³ It would be interesting to have some of these "laws of mental development" stated. About two years before this latter statement was published, Pearson,⁴ working with the somewhat limited material of the Swedish psychologist Jaederholm, concluded that "the unit of a year of mental growth receives support from the data as a constant quantity,"⁵ and that it is practically equivalent to the standard deviation of the distributions of intelligence in children for the ages under consideration.

Binet's method does not, however, stand or fall with the determination of this question. It is sufficient for practical purposes to state the position of an individual with reference to a given group of tests, *e. g.*, those which 8-year olds can pass on the average and those which 7-year olds can not pass. This does not involve materially the question of the amount of difference in intelligence which separates these groups, and certainly not that of *how much* superior a given group or a given test is to another group or test. These problems are, however, involved throughout the whole scheme of weighting in the so-called point-scale,⁶ with which Yerkes wishes to replace the Binet scale, although, since the weight-

¹ *Psych. Rev.*, Vol. 23, pp. 407 ff.

² *Eugenics Rev.*, Vol. V.

³ *J. of Ed. Psych.*, Vol. VII, p. 163.

⁴ *Questions of the Day and Fray*, No. IX. Cambridge University Press, 1914.

⁵ *Ibid.*, p. 44.

⁶ *A Point Scale for Measuring Mental Ability*, R. M. Yerkes, J. W. Bridges, and R. S. Hardwick. Warwick & York, 1915. A curious slip is made in a footnote to

ing is purely arbitrary, the bearing of the problems seems not to have been recognized. For example, in Test 2, Response to Binet Pictures, "for each picture 1 point is credited for enumeration, 2 points for description, or 3 for interpretation, as the case may be."¹ Either this means that interpretation is as much superior to description as the latter is to enumeration, or that interpretation should count three times as much as enumeration in the measurement of intelligence; but for evidence as to the first of these suppositions or reason for the second, *e. g.*, as to why 3 times rather than 10 or 20 times, the reader will look in vain. With data now available, it is possible to determine the first of these relationships, at least approximately and to establish units of measurement either in terms of age or group variability (sigma differences). An arbitrary method of weighting has, therefore, little justification at the present time, and, unless, perchance, its sponsors are good guessers, may be pernicious in its effects when applied to such an important undertaking as the delimitation of the feeble-minded.²

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ACTIVITIES OF CLINICAL PSYCHOLOGISTS

The following report and recommendations were adopted by the New York Psychiatric Society and ordered forwarded to the leading medical and psychological journals for publication.

At a meeting of the New York Psychiatric Society held December 6, 1916, a committee was appointed to inquire into the activities of psychologists and more particularly of those who have termed themselves "clinical psychologists" in relation to the diagnosis and treatment of abnormal conditions. This committee desires to make the following report.

We have been greatly impressed by the earnestness and success with which psychologists are endeavoring to make their science serviceable in dealing with the practical affairs of everyday life. We wish to record our belief in the wide usefulness of the application of psychological knowledge and of the findings of certain psycho-

chapter 2. "The numbers there given in parenthesis indicate the Binet tests, *if any*, [italics added by the present writer] of the same or similar character."—of the 20 tests employed, 19 are thus referred to.

¹ *Ibid.*, p. 17. Examples may be multiplied. For example, a total of 6 points is credited for description and 4 for detecting the missing parts of pictures (both 2-year tests); 3 points for "æsthetic judgment" of pictures (a 5-year test); 2 for drawing a diamond (a 7-year test); and 2 for the comparison of two weights (a 5-year test), etc.

² Note the remarkable conclusions of M. T. Woolley with the point scale as to the "startlingly high" percentage of feeble-mindedness in 18-year old industrial workers—40.5% of boys and 42.5% of girls, or by a more conservative standard 25.5%! (*The Survey*, Nov. 4, 1916.)

logical tests in such fields as the modification of educational methods with reference to individual differences, the vocational problems presented in various special industrial operations, the development of scientific methods in advertising, salesmanship and other means of business appeal and in the investigation of such special problems as the relation of environmental factors to the quality and quantity of the output of the individual. We feel that the results to be attained in these fields justify the belief that the widening of the scope and application of psychological knowledge will make psychology one of the most useful of the social sciences instead of a narrow field for study and research with but little actual contact with the practical problem of life.

We have observed with much distrust, however, the growing tendency of some psychologists, most often, unfortunately, those with the least amount of scientific training, to deal with the problem of diagnosis, social management and institutional disposal of persons suffering from abnormal mental conditions. We recognize the great value of mental tests in determining many questions which arise in dealing with such patients but we have observed that most of such work which is being done by psychologists and particularly by persons whose training in psychology is confined entirely to learning how to apply a few sets of these tests, is carried on in schools, courts, correctional institutions and so-called "psychological clinics," quite independently of medically trained workers who are competent to deal with questions involving the whole mental and physical life of the individual.

We believe that the scientific value of work done under such conditions is much less than when carried on in close coöperation with that of physicians and that serious disadvantages to patients suffering from mental disorders and to the community are likely to result and, in many instances which have come to our attention, have resulted. This is especially true when the mental condition of the patients examined involves questions of diagnosis, loss of liberty or educational issues more serious than redistribution of pupils or rearrangement of courses of study. In spite of these facts two States have enacted laws permitting judges to commit mentally defective persons to institutions upon the so-called expert testimony of "clinical psychologists" regarding the abnormal mental conditions from which patients are alleged to suffer. We believe that the examination upon which a sick person is involuntarily committed to permanent institutional custody is one of the most serious responsibilities assumed by physicians and that in no cases whatever should it be entrusted to persons without training enabling them to take into consideration all the medical factors involved. The same is true of mental examinations of juvenile delinquents and criminals whose whole careers depend, in many cases, upon the determination of their condition.

We desire to make the following specific recommendations:—

1. We recommend that the New York Psychiatric Society affirm the general principle that the sick, whether in mind or body, should be cared for only by those with medical training who are authorized by the state to assume the responsibility of diagnosis and treatment.
2. We recommend that the Society express its disapproval and urge upon thoughtful psychologists and the medical profession in general an expression of disapproval of the application of psychology to responsible clinical work except when made by or under the direct supervision of physicians qualified to deal with abnormal mental conditions.
3. We recommend that the Society disapprove of psychologists (or of those who claim to be psychologists as a result of their ability to apply any set of psychological tests) undertaking to pass judgment upon the mental condition of sick, defective or otherwise abnormal persons when such findings involve questions of diagnosis, or affect the future care and career of such persons.

PSYCHOLOGY AND PSYCHIATRY

The recently adopted report and resolutions of the New York Psychiatric Society which are printed in this number of the *BULLETIN*, deserve more than passing notice. They suggest several important points of interest to all psychological investigators, as well as to those who are termed "clinical" psychologists.

The relations of psychology and psychiatry are brought forward as matters for discussion, even though the recommendations of the New York Society may be satisfying to its members. The report and recommendations are paralleled by a similar equally one-sided resolution regarding psychological diagnosis adopted by the American Psychological Association at its 1915 meeting (see the *BULLETIN*, 1916, 13, page 49). Both of these actions indicate an appreciation of some mutual relationship between psychology and psychiatry, but at the same time they show an equal amount of mutual distrust of the capabilities of the followers of the other subject. The psychiatrist would have the psychologist barred from dealing with abnormal persons, and the psychologist insists that the psychiatrist is not competent to give and to interpret mental tests.

The present is a most opportune time for a careful consideration of the independence, the interdependence, the correlation and coordination, and the responsibilities of different but allied lines of work. It is to be hoped that a way may be found to bring the psychiatrists to a better understanding of the value to them of psychology, and to bring the psychologists to a better appreciation of the importance to them of psychiatry. It is also important that points of misunderstanding or of disagreement be carefully considered together, not by each of the biased groups for itself alone. With the country at war, and needing the best work of all, it would be most fitting if psychiatrists and psychologists should get together, throw away as far as possible their usual intolerances and prejudices, and see if there can be found a cooperative working scheme. Differences may arise and be unavoidable, but in most cases they will be minor if the two sides are examined. The writer would be glad to see such a conference inaugurated, and perhaps continued from year to year or as occasion appears to demand it. We could expect to be rid finally of the psychiatric reproaches that psychology is unpractical and at the same time

that it is trying to usurp some of the functions of the practical psychiatrists. We might also hope to have certain apparent inconsistencies in the report and recommendations of the New York society explained. Some of the points brought up in that report may be looked at from different angles.

"Expert testimony" is probably the darkest side of medicine. Some have not hesitated to call it disreputable. When a so-called medical psychiatrist makes a psychiatric diagnosis of "brain storm," when two so-called psychiatric experts, each with the same facts (hypothetical question), testify respectively that an individual is "sane" and "insane," it should not be possible for psychiatrists to affirm that physicians as a class are competent to make proper diagnoses and are the only ones "qualified to deal with abnormal mental conditions." If some states have decided to utilize psychologists as experts regarding the normality or abnormality of the mental states of individuals it is conceivable that it was done because previous medical expert testimony was not satisfactory. It might also indicate that the West is more progressive than the East.

While it may be proper to admit that the psychologist who is ignorant of physical defects and their possible relations to mental abnormalities goes beyond his legitimate field in making a definite mental diagnosis of feeble-mindedness or of a psychosis, unless he be legally authorized to do so, it is equally true that he may be able to determine the presence of a mental abnormality just as well as the ophthalmologist may be able to discover a visual defect. The visual defect may accompany an apparent mental abnormality but it may not be the cause of it. The mental abnormality may be due to certain physical disturbances, or it may be "ideopathic." It is doubtless the function of the psychiatrist to take the report of mental abnormality with that of Argyll-Robertson pupils and any other data and determine or diagnose the condition as a whole. It should not be thought, however, that the psychiatrist alone is competent to determine the mental state of a patient. If his duties consist in knowing all of the physical side and all of the mental side, he is the nearest approach to that rare and fast-disappearing race of physicians who are specialists in the skin and its contents. It may be that the mental expert, as distinct from the psychiatrist, has a place in the general scheme of examination and investigation (for diagnosis and treatment) of mental abnormalities. It may also be that some of the abnormalities of which psychiatrists talk as fields for the psychiatric expert, such as criminality, prostitution,

vagabondage, etc., do not rightly belong to their field. It is of interest to note in this connection that the report uses the descriptive term "abnormal" rather than "pathological," and if the term is used correctly it would mean that the intellectually superior are psychiatric material as well as the intellectual dwarfs.

Those who are competent to deal with questions "involving the whole mental and physical life of the individual" are few, and it is doubtful that they can by themselves do all the necessary work of a psychological nature and of expert testimony for which they might properly be used. A responsible and well-informed psychiatrist told the writer not long ago that there were not more than 150 competent psychiatrists in this country. A few days later an equally eminent specialist in the same line of work estimated that the number was certainly not greater than 100, and more likely nearer 50. If the largest of the three estimates be nearly correct it would appear that there might be functions for psychologists in relation to certain practical problems, even though these functions do not include those of final judgment regarding the advisability of incarceration of the mentally abnormal.

The large percentages of diagnostic errors, which have been reported in recent years in the medical press, are evidence that relatively few physicians are competent to determine many of the anatomical and physiological abnormalities of patients for which work they have received a great amount of training. Special training in mental facts and in psychological methods has not been part of the medical school course, and relatively few physicians have attempted to become acquainted with them except in a superficial way or in a very narrow field. They would probably admit that a similar way of becoming acquainted with typhoid fever is entirely inadequate, and psychologists may well wonder what innate qualities physicians possess, or what special observation powers they have, or the kinds of instruction they receive which make them competent to deal with the whole mental life of an individual. It has not infrequently been assumed that no training in normal psychology is needed for the understanding of abnormal mental conditions. On the contrary, for the appreciation of diseased bodily conditions it is considered necessary to study anatomy, physiology, pharmacology, bacteriology, and pathology as well as to come in close contact with numerous disease forms. Is this reasoning, we may ask, an indication of adherence to the doctrine of psychophysical parallelism or only an ordinary form of prejudice or bad logic?

One further point indicating the poor opinion prevalent among psychiatrists with respect to psychologists is shown in the composition of the National Committee of Mental Hygiene (founded in 1909). This Committee works for the "conservation of mental health." More than one third of this Committee are physicians, of which a large number are psychiatrists. The remainder are college presidents, bankers, merchants, women of wealth, social workers, professors of the social sciences, with two professors of education as the nearest approach to any recognition of psychology as one of the sciences concerned with mental matters. (The data were taken from the inside cover of the first number of *Mental Hygiene* (January, 1917). A more recent letter head, just received, now shows one psychologist among the 90 members of this Committee.) Should psychologists interpret this to mean that it is the opinion of the large number of psychiatrists on this Committee that a psychologist has less interest and less function in the conservation of mental health than a college president, than a pathologist, than a surgeon, or than any of the other representatives of different subjects of study and research?

SHEPHERD IVORY FRANZ

REPORT OF A CONFERENCE ON THE REEDUCATION AND REHABILITATION OF MAIMED AND CRIPPLED SOLDIERS

A conference on reëducation and rehabilitation of the maimed, crippled and otherwise disabled by war, has been held under the auspices of the General Medical Board of the Council of National Defense. The meetings were attended by the following: Dr. James Bordley, Jr., Baltimore (ophthalmology); Dr. John Staige Davis, Baltimore (plastic surgery); Mr. C. R. Dooley, Pittsburgh (vocational education); Dr. Shepherd Ivory Franz, Washington (neurophysiology) *Chairman*; Mr. Frank B. Gilbreth, Providence (management engineering); Dr. R. W. Lovett, Boston (orthopedic surgery); Dr. Harris P. Mosher, Boston (otology); Dr. T. H. Weisenburg, Philadelphia (neurology); and Dr. William A. White, Washington (psychiatry).

The report and recommendations of the conference which follow were based upon a knowledge of many of the conditions which were encountered in England, Canada, France, and Germany, and references are made below to some of these facts.

1. It is believed that the work of a committee on reëducation and rehabilitation of the maimed and crippled will be most effectively performed if one or more medical officers be designated to coöperate with it.

2. Activity with respect to reëducation work should begin as early as possible. This should be by intensive instruction of medical officers, in medical specialties, at the present and future army medical camps or by sending selected squads to established medical schools for short terms of special instruction.

The medical specialties that have direct bearing upon the problems of reëducation are: Orthopedic surgery, plastic surgery, neurology, psychiatry, ophthalmology, and otology.

3. If reëducation is to be carried out with the best results, it is desirable that special treatment of the wounded should be carried out under the direction of specialists as early as possible.

4. The establishment of reconstruction hospitals, or hospital schools, for the repair of cripples and disabled persons is essential. These institutions should preferably be widely distributed, and should be large rather than small. It is preferable to utilize existing institutions, when suitable or adaptable for the work, rather than to build others.

Hospital schools for crippled are particularly adapted for such use, having beds, instrument shops, and industrial schools. To supplement the three state institutions, Massachusetts, Minnesota, and Nebraska, now available, and such similar private institutions which may later be offered is necessary. Public hospitals and other public institutions may be utilized for the purpose.

Convalescent homes which may be separate from hospitals will also be required. Large country places, vacant country hotels, etc., would be suitable. The institutions should be under military control.

The conference would recommend a census of suitable institutions, which would be available in different parts of the country.

In France in April, 1916, there were about 50,000 amputated and otherwise disabled soldiers needing medical reconstruction and reëducation. Biesalski has estimated that in Germany 40,000 cripples were produced in the first few months of the war. From 70 to 80 per cent. of the wounded returned to Canada have needed reconstruction and reëducation work.

5. Relatively few of the cripples can return to their former occupations because of their disabilities, and they must be taught new ones.

The experience of other countries now at war shows that careful examinations, physical and mental, must be made of the crippled and maimed as a basis for the determination of the individual capabilities for reëducation. The conference believes that careful analysis should be made of different occupations to determine the anatomical characteristics necessary for them, as a guide for those who will have charge of vocational education. Careful attention should also be given to the matter of modifying the occupation to fit the individual.

In England scientific examination of the men was not made at first, and many cripples were permitted to undertake to learn occupations for which they were not fitted physically, mentally or by previous experience. France has also had the same experience.

6. The conference believes that every disabled soldier, whether or not unable to follow his former occupation, should be kept under military discipline until the completion of physical reconstruction and reëducation.

It has been found that many disabled soldiers in European countries would not undertake reëducation, and apparently preferred to be permitted to remain helpless, and, thus, a social liability. Every man should be compelled to undertake to learn an occupation that will enable him to be self-supporting or partly self-supporting. This is quite apart from the consideration of pensions, a matter which the conference was not called upon to discuss.

7. Reëducation must be a coöperative endeavor of all the special interests involved: medical, educational and social.

8. A committee on vocational education has been formed under the auspices of the Council of National Defense. The work of that committee and that of a committee on the reëducation and rehabilitation of the maimed and crippled where they meet should be intimately correlated.

9. The conference feels that as great publicity as is consistent with public policy should be given to the work of reëducation and rehabilitation of the maimed and crippled. The public should be taught that the cripple is not to be considered a total economic loss, but should realize that if suitably trained he will be an economic asset.

The following specific recommendations of the conference were made:

1. That a permanent committee be appointed to carry out whatever plan may be adopted, and

2. That this committee should contain representatives of the various medical, educational, and social interests concerned, and should comprise in its membership representatives of the Army, the Navy, the Public Health Service, and the American Red Cross.

The report and the recommendations of the conference were taken under consideration by the Executive Committee of the General Medical Board.

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THE
PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

SPACE ILLUSIONS

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Peterson (1) gives a description and a suggestive analysis of two illusions of direction. The first few moments in a new situation are critical; the attitude first developed is likely to persist. Several favorable conditions for the development of an illusion are given: inability to maintain or transfer the correct orientation in previous situations to the new one, due to sleep, travelling in the night, mental confusion, etc.; cloudy weather so that the old orienting attitudes toward the sun can not be utilized; and unusual directions of the roads or streets with their false suggestive effect. There exist probably individual differences as to the features of the environment upon which one's orienting attitude depends. The existence of any innate sense of direction is denied.

Pintner and Anderson (2) presented the Müller-Lyer illusion to groups of children of ages 6 to 14 years, to feeble-minded children of a mental age of 9 years, and to adults. The number per group ranged from 13 to 38. As the age increased there was a decrease in the size of the illusion and in the range of individual variability, though the decrease was not at all uniform. The differences for age were so small and the group variability so great that the test can not be used as diagnostic of age. The influence of age is due in part to greater experience in judging lines and in part to greater attentive control. Contrast is also regarded as a factor.

The paper of Southard (3) was designed to illustrate the method of Royce's logical seminary. Most delusions are pragmatic, disorders of will and attitude, and they are correlated with frontal

lobe disturbances. The frontal lobe is regarded as an organ for the elaboration of motor attitudes. The attempt is made to suggest an analysis of these delusional attitudes in terms of grammatical verbal concepts such as mood, tense, voice, person and gender. For example, delusions of grandeur are characterized as active, delusional persecutions as passive, and states of self-accusation as reflexive.

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PSYCHOLOGY OF TESTIMONY

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The past two years have brought forth relatively little in the field of testimony and the interruption of communication with Europe has made it impossible to obtain copies of periodicals in which some of the references are to be found.

Altmann (1) contributes an anecdote to illustrate how completely a group of persons may be misled in their understanding of the words of one of their number when all are under the sway of emotional excitement. The person in question was accused of speaking disrespectfully of Archduke Ferdinand: all his hearers testified against him, but his behavior was so at variance with this alleged speech that one of the judges was led to probe into the matter and succeeded in finding the source of the auditory confusion.

Gross (2) prints a questionnaire for the purpose of obtaining and classifying information concerning the peculiar cases sometimes reported in trials in which a certain sound (cry, whistle, bell, etc.) is reported as clearly heard by several witnesses at some distance from the source of the sound but as not heard by other witnesses who were nearer the source. The questionnaire pertains primarily to the physical aspects of these situations, though it is evident that mental factors may also be operative.

The two other references to Gross (3, 4) were not available when this review was prepared.

Henning (5) calls attention to the fact that those who, since the earlier experiments of Wertheimer and Klein, have tried to use the association method for the diagnosis of knowledge of matters of fact have by no means been uniformly successful. One of the main difficulties lies in the circumstance that it is not easy to produce in the laboratory, conditions that sufficiently resemble those of daily life. To meet this difficulty Henning commends the resort to the "movies," which are always accessible and which supply situations full of life and with emotional backgrounds. Another difficulty is inherent in the association method itself, as ordinarily conducted, and this Henning would meet by the use of what he terms the "double association" method. The plan is to utter the stimulus word as usual but to follow this after about one second with another or "disturbing" word (*Störungswort*) and to have the subject respond only after the second word is uttered. As would be anticipated, the subject commonly responds with a word that "fits" the stimulus word as it is qualified or restricted by the disturbing word. In other words, the experiment takes on somewhat the color of a "controlled association" experiment. As we understand it, it is much more difficult to avoid the "set" given to the association by this double stimulus than it is to avoid the "set" that would be supplied by a single stimulus word. In any event critical stimulus words are almost invariably followed by delayed responses, so that the efficiency of the method for diagnosis is markedly augmented by this plan of procedure. Repetition of the test, even after the lapse of considerable time, yields results much like the first testing.

The contention of von Karman (6) is that, while the last two decades have seen the accumulation of a large mass of data concerning the psychology of testimony, and while many judges and lawyers are not unmindful of these data and of their importance, yet the data are far from accessible. What is wanted is an arrangement of all this material in such a form that it can be gotten at by the questioner when actually at work taking testimony. The arrangement must be made with the needs of the man in the field in view rather than to suit the theoretical investigator and psychologist. The author then sets out a provisional schema, a sort of scaffolding, for the construction of this working guide for questioners. The main points in this schema are (with some paraphrasing) as follows: we must consider on the one hand the reliability of the witness as a testifier, on the other hand the objective truthfulness of his

testimony. His reliability hinges on two things: (1) the exactness of his observation and (2) the correctness of his report of his observation. Exactness of observation is itself conditioned by general physical and mental condition (with numerous subdivisions—eyesight, hyperesthesia, neuropathic tendency, suggestibility, undeveloped mentality, arrested mentality, etc.), also by the spatial and temporal conditions under which the observation was made (whether favorable or unfavorable), and also on the freedom of the observer from other distracting mental processes, whether intellectual or affective, at the time of observation. The correctness of the report upon this observation hinges upon the general retentive capacity of the witness, upon the length of time elapsed, upon the number of times he has given the testimony and also upon his use of words (the talkative, the taciturn, the man of scant vocabulary, each gives testimony that is affected by his capacity to translate what he remembers into speech). Finally, the objective truthfulness of any testimony must be controlled by checking it with all the known facts of the case and with the behavior of the accused and similar objective data with which it may be compared.

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PSYCHOTHERAPY

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Those interested in practical psychology will welcome the attempt of Rabbow (16) to trace out the first beginnings of psychotherapy, and will find in the doctrine of the ancients suggestions that are applicable even to-day. The present volume deals only with Greek and Roman concepts on the treatment of anger. It

includes much that is of interest in the history of the theoretical psychology of the emotions. Gregor's article (9) is an excellent introduction to the modern literature on psychotherapy. He divides the subject into two sections. I. Fundamental principles. Here he points to the interaction of body and mind as the source of a great multiplicity of symptoms. As Southard, *e. g.*, has shown (*J. of Abnor. Psych.*, 1912) delusions that have reference to the body often rest upon bodily changes. He cites a number of excellent studies of the use of psychotherapy in internal medicine and pediatrics. He regards hydro- and electro-therapy and occupational cures to a large extent mental treatment. II. In the next section he considers special methods: (1) *Hypnosis*. He looks upon hypnosis as a phenomenon of dissociation and points out that, therefore, its effects must be local on the dissociated idea, but nevertheless advises its use in order to do quickly what would otherwise have to be accomplished by a long process of persuasion. (2) *Psychoanalysis*. He gives a short outline of fundamental Freudian concepts. He doubts that bringing the old emotion to light and the resultant abreaction represents the essential mechanism of the cure. He thinks that the most important adjuncts of psychoanalysis are clinical methods and especially the anamnesis which in most cases suffices by itself. He brings forward the criticisms that various authors have made against the Freudian postulates, and gives a short description of Jung's method of association. (3) *Persuasion*. This he looks upon as the method of widest application. It consists essentially in the physician's explaining the mental nature of the symptoms and helping the patient to overcome them by an insight into their mechanism.

Bjerre's work (2) on the history and practise of psychoanalysis is not the systematic treatise that the title indicates, but consists rather of a collection of essays on several persons prominent in the history of psychotherapy, a chapter on the nature of hypnosis, another being an extract from a case history and a final chapter on points of view and outlooks. Nevertheless of all the works the writer has seen on psychoanalysis it is the coolest, sanest presentation and the best work for any one unacquainted with the subject to choose for a first introduction. The chapter on "Psychoanalysis as a Science and Method of Treatment" is an excellent presentation of the Freudian doctrines. Bjerre seems to lay more stress on sublimation than Freud, who seeks his goal mainly through transfer. He again differs from Freud in accentuating the value

of conscious factors along with the unconscious in the production of psychoneuroses. Pfister (15), a seminary teacher in Zurich, already well known for his interesting psychoanalytic studies, has undertaken an introductory textbook on the history, theory and technique of psychoanalysis. Besides the usual matter on this subject he devotes a section to what he terms pedanalysis. By this he understands psychoanalysis of the young as practised by teachers rather than physicians. He advocates the use of psychoanalysis by teachers because of the large number of neurotic children, because the teacher sees many psychoses in their incipient stage, because physicians are not numerous enough to cope with the cases to be treated and for the most part have no appreciation of psychoanalytic methods. One will find in Ferenczi's (7) contributions to psychoanalysis a study of various psychotherapeutic problems from the extreme Freudian point of view. Coriat (4) supplies a long-felt want in giving the statistics of the results of psychoanalysis in a fairly extensive series of cases. He reports on 93 patients. Of these 46 were cured, 27 much improved, 11 improved and 9 were not improved.

Von Stauffenberg (21) gives an interesting account of his personal experience with psychotherapeutic methods. He finds that the personal suggestion of simple conversation will accomplish a great deal, but that hypnotic suggestion will do much more. Some of these cases are permanently cured by mere suggestion. But mere hypnotic suggestion often fails. It does so whenever the source of the difficulty lies in a buried emotion which causes a condition of mental strain. In such cases the emotion must be abreacted in the hypnotic state, as Frank suggested, by turning the subject's attention to his visual imagery. When this is done, the emotion at the base of his psychosis will reappear and be abreacted. A further group of cases cannot be cured by even this procedure. They are patients suffering from deep underlying conflicts between ideals and accomplishment. These are the cases which yield promptly to the Freudian psychoanalysis. Scott (19) reports ten cases treated by hypnotism: telegraphic neurosis, cured; hysterical paralysis, cured; tic, cured except during rare moments of excitement; choreiform movements; obsession, could not be hypnotized, but improved; masturbation, cured; hysterical chorea, could not be hypnotized, no improvement; traumatic paralysis, cured; stammering and persistent headache, stammering almost, headache completely cured; agoraphobia, cured. Wilkinson (23)

reports a number of cures obtained by hypnotism. These cases were: a functional abasia, hysterical torticollis, epileptiform convulsions in a boy of eleven following severe fright, neurasthenia, "spinal" trouble. Smyly (20) attempted to cure 32 cases by suggestion in hypnosis. He failed completely to hypnotize three. He attempted to produce operative anæsthesia on 16 cases; one of these was only slightly influenced. In another ether had to be used as an adjunct. The rest (8 of which were purely experimental) were reported as successful. In 8 cases of insomnia there was only one failure. In 6 cases of phobia and other psychoneurotic symptoms there were only one complete cure and one case much improved. Moderate success was obtained in two alcoholics. Two cases of spasmodic torticollis were much improved. Of three cases of stammering two were cured, one was improved. Three cases, females, with abdominal symptoms were improved. One male after trial was referred to surgeons. Three cases with genito-urinary symptoms cured, the others could not be hypnotized. One case of excessive blushing and hyperidrosis of hands was cured with somnambulism plus psychoanalysis. Two cases of inveterate headache were only slightly relieved. Seven cases of ergophobia were all improved. Bernheim (1) gives a short résumé of the principal views of hypnotism and claims that he instituted modern psychotherapy when he pointed out that the therapy of suggestion is just as efficacious in the waking state as in the hypnotic state. He says that whatever phenomena can be produced in a subject by hypnosis may also be caused by suggestion without hypnosis. Profound hypnosis which abolishes mental activity abolishes also suggestibility. Suggestion, therefore, and not hypnosis lies at the basis of all psychotherapy.

A second edition of the already well known work of Dejerine and Gauckler (5) appeared in 1915. Their position lies between that of Dubois and Freud. "Neurasthenia is constituted by a general ensemble of phenomena, which result in the non-adaptation of an individual to any continued emotional cause and the struggle of the individual to bring about such an adaptation" (p. 235). The genesis of all neuropathic states is to be sought in some emotional cause. Often but not always the emotion is sexual. In the psychoneuroses there is no place for drug therapy. All psychotherapeutic measures may be reduced to suggestion and persuasion. Suggestion in the hypnotic state has a limited application. The method par excellence is persuasion. By this method the physician

explains to the patient the mental mechanism by which his symptoms are produced. He appeals to the patient's reason and attempts to give him a rational basis for a renewed voluntary control of himself. Allied to the work of Dejerine and Gauckler is the much less satisfactory treatise of Burlureaux (3). His scheme of mental treatment involves: (a) the physical and mental examination; (b) an optimistic attitude on the part of the physician; (c) the removal of the patient from the milieu in which the disease was engendered (this may mean the actual isolation of the patient from parents and friends); (d) removal of external and internal obstacles to the cure. All this is to be done mainly by simple conversation. Hypnotism may be at times called in as an auxiliary method. Father Raymond (17), chaplain to the Kneipp Institute at Woerishoven, has written a work intended for the perusal of the patient rather than the physician. It touches especially on religious difficulties. With him "psychotherapy undertakes to restore the lost power not by a stroke of the magic wand, but by means of patient and persevering efforts it leads a person on little by little to regain self-control and to become as far as possible master of himself once more. Kindly interest and persuasion are the methods advocated. Ferrari (8) reports the cure of four cases by persuasion and suggestion along with such simple expedients as "attracting the attention" to the normal side by stroking the other in a case of hemicrania.

Dejerine's position that there is no place for drugs in psychotherapy has not found universal acceptance. Vogt (22) maintains that it is never lawful to omit drugs in psychotherapy. Their use in psychotherapy should, however, be somewhat different from their administration in the presence of an organic lesion. One should never attempt to treat transitory symptoms by special remedies. Nor should a psychogenetic disturbance of cardiac activity be treated like a real physical insufficiency. One should direct his treatment towards tonics and general strengthening measures.—The reason for this, he maintains, lies in the fact that "feelings, sensations and emotions are compounded of mental and bodily elements"; and as Wundt has pointed out the consciousness of the ego is a continuous chain of external bodily sensations and internal experience. Legrand (13) writes from the standpoint that psychotherapy is essentially suggestion and as such may and should be reinforced by other measures. It should never be employed alone. Among the physical adjuvants he attributes a special value to a sojourn in mountainous altitudes.

Various writers enter into the question of the real cause of psychotherapeutic cures. Williams (24) advocates a rational psychotherapy which does not depend upon "suggestion" or morbid anatomy, but on a scientific psychoanalysis and synthesis, a dissection of the mental tendencies until the real root of the fault is detected, followed by a putting of them together pointing in a new direction. At the same time he thinks that "there is no sub-conscious mind; what does happen is that a set of nerve currents are set up within the brain of which a person is unaware, because his attention is upon the currents elsewhere in the brain." Schulz (18) after a sketch of the history of psychotherapy points out that the value of hypnosis lies in suggestion which can be given without the spectacular accompaniments of mesmerism. He thinks that Dubois's method of reasoning with the patient is to a large extent suggestion. He advocates a method of reëducation in which the entire personality is made over and the use of all methods by which this may be assisted. He thinks the Freudian universal sexual psychoanalysis is to be laid aside and that the aim of all psychotherapy is to lead the patient away from himself. Pfeiffer (14) contrasts the psychotherapy of suggestion with that of reasoning, and argues that both cure by arousing an emotion. Suggestion does not implant an idea, but rather the psychophysical complex of an emotion. So also reasoning, when it cures, does not do so by showing that a fixed idea is absurd, but by provoking an emotional reaction.

Eschle (6), a pupil of Rosenbach, discusses the psychotherapy of functional disturbances of coördination. Every voluntary movement involves the innervation of a group of muscles and the simultaneous inhibition of their antagonists. A disturbance of coördination results when this delicate balance is upset by what Rosenbach terms a perverse innervation, which in the last analysis is to be attributed to the will. In cramp the will has no part, in perverse innervation it has. He advocates as psychotherapeutic measures the punishment of the refractory muscles directly or indirectly by painful faradic stimulation or by the use of bad-tasting or evil-smelling drugs such as asafœtida. He would supplant the conviction of organic insufficiency with the assurance of normally functioning organs. Such procedures as Frenkel's exercises are included under the name of psychotherapy. In general he seeks to help the "will" to reëstablish the disturbed balance, but pays no attention to what the psychoanalytic school would call etiological moments.

Healy (10, 11, 12) has opened up a distinct field of psychotherapy in the application of psychological analysis to the problems of juvenile delinquency.

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RECENT LITERATURE ON HYPNOTISM

BY H. C. McCOMAS

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Remarkably little has appeared in the last five or six years which deals directly with hypnotism. The interest which formerly gave rise to a prolific literature has been diverted into other lines, chiefly psychotherapy and psychoanalysis. This is unfortunate in that it brings hypnotism with all of its difficulties and inconsistencies into other lines of research without first clearing away its own obscurities.

How inchoate the subject is at present is well illustrated by the articles of Bernheim and Claparède and the resulting Conference in Munich upon the "Definition, Psychological Interpretation and Therapeutic Value of Hypnosis" (3), Bernheim (2) had maintained that hypnosis is not a peculiar and unique phenomenon. It is nothing more than a sleep brought on by suggestion. The so-called hypnotic phenomena, catalepsy, anæsthesia, suggestibility and hallucination are to be obtained from suggestible subjects in the waking state. The hypnotic state has no particular properties. It differs, when genuine, in nothing from natural sleep. It has no special therapeutic value, though it is serviceable in certain cases.

Claparède (5) found this conception inadequate and contended that hypnosis is sufficiently unlike other psychic states to warrant a sharp distinction. He sought to relate it to catalepsies in animals and believed both go back to a common phylogenetic origin.

These divergent views are amplified in the Munich Conference. Here Forel opened the discussion by insisting that hypnosis is unlike normal sleep. It is induced by an operator and controlled by him. From 98 to 100 per cent. of all normal persons are susceptible and it has a therapeutic value in itself and in the suggestions it permits.

In the discussion which followed Bernheim, Claparède, Trömner, Dupré, Frank, de Montet, Vogt, and others took part. The consensus of opinion did not bear out Bernheim's position.

Bjerre (4) attempts an analysis and explanation of hypnosis based upon characteristics which are analogous to those of the foetal life. Hypnosis from this point of view would represent a return to pre-natal passivity in which automatic functions predominate.

More significant is Mangold's (7) work, in what he calls "animal hypnotism." He succeeded in inducing a cataleptic state in chick-

ens, doves and guinea-pigs. The animals, however, seemed to retain some of their instinctive activities despite their apparent immobility. His further work (8) shows the broader possibilities of this type of investigation, especially in the death-feigning instincts. Since the cataleptic state may be produced in animals which have no cerebrum the psychic factor is unimportant; nevertheless, Mangold holds that his more typical forms of animal hypnosis must be ranked beside the human and studied in that light.

Smirnoff (9) tried the common experiment of forming a blister upon the arm by suggesting a burn. He found little difficulty in getting results with one subject upon whose arm a larger blister formed in response to suggestion than from an actual burn.

A series of experiments by Alritz (1) upon one subject demonstrates the influence of the operator upon the subject in a unique way. The subject was covered with an opaque cloak, the ears were stopped with cotton and a sheet of thick glass was placed above one arm. After hypnotizing the subject passes were made above the glass. These produced an insensitivity in the arm and an increased sensitivity in the opposite arm. This effect was also obtained by an operator who did not know what results to expect. Alritz believed that his subject had no clues from any of the senses concerning the passes and that he also had no information concerning them. He believes the phenomena are due to a form of nervous energy emanating from the operator's hands.

Wilkinson (10) reports a good example of heightened sensibility and a well-nigh incredible case of astuteness in post-hypnotic conduct.

Moral regeneration was attempted by Hopkins (6) upon some London and New York gangsters. The boys responded rather well when their environment was changed to enable them to live out the suggestions made in hypnosis.

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TESTS

BY FRANK N. FREEMAN

Methodological Discussions.—The most thoroughgoing article which has yet appeared upon the theoretical foundation of the age placing of tests, such as is involved in the Binet-Simon Scale, is the pair of articles by Otis (28). Otis argues that tests should be placed at the age at which 50 per cent. of children pass them, and that the empirical choice of any other standard, as 75 per cent., is due to an error in scoring. He discusses at length the rate of mental development, the relation of the rates of different individuals and deduces by means of a number of diagrams the proportion of individuals at various ages above and below the standard age who should pass a standard test. The practical outcome is a chart which is designed to be a guide in placing a test at the proper age. The principles of an absolute scale and of an intelligence quotient based upon it, are finally laid down. Kelley (20) adds that the criteria of the placing of single tests are different from those which apply to groups of tests, and that the probability that an individual will pass all the tests standardized for his age depends on the degree of correlation between them. Yerkes and Wood (42) compare the coefficient of intelligence and the intelligence quotient with other means of calculating mental age, and give distribution tables of coefficients of intelligence for the Point Scale. Pintner and Pater-son (31) discuss the relation of rates of mental development at different levels in their relation to the mode of expressing mental age and make application to both the Binet and Point scales. Doll (13) presents data from feeble-minded and normal cases to show that the intelligence quotient may vary up or down in successive years.

Ruml (33) brings to light a Pearson formula which makes it possible to determine how closely a test will correspond with some

other standard—as vocational or scholastic—in dividing a group into two sections.

Seashore (34) presents results of experimentation to show that simple, elementary forms of discrimination do not alter their threshold with practice, and he believes that tests would show that they do not change with age. The implication is that such tests are more desirable than less elementary ones.

The symposium (35) deals mostly with the merits of the age principle and the point scale principle, but includes a good deal of information concerning problems and methods which are being pursued by various workers.

The nature of the articles by Pintner and Paterson (30) and Bronner (5) is indicated in the titles.

Standardization or Evaluation of Old Tests.—Haines (18), Kohs (25) and Martin (26) contribute to the evaluation of well-known test series. King and Gold (23) present percentages of passes, and frequencies of answers similar to the Kent-Rosanoff free association lists, for 158 opposites, obtained from tests of 100 adults. Doll (12), Wallin (40, 41) and H. H. and M. H. Young (43, 44, 45) contribute to the standardization of modifications of the Seguin form-board. Bruckner and King (7) give statistics upon what they call the Fernald form-board, and Bronner (6) criticizes their conception of the test and method of giving it. Anderson and Hilliard (1) use a number of common tests.

New Tests.—A variety of ingenious tests for originality or initiative are described, and the results of their application to adults are presented by Chassell (9). Porteus has devised and partially standardized by age a number of puzzles of the maze type which he seems rightly to regard as capable of testing foresight or prudence, and as a good supplement to tests of the Binet type. Cunningham (10) finds the results of the Porteus tests to agree well with the Binet scale results. Dearborn, Anderson and Christiansen (11) describe puzzles derived from the form-board type of test which can be arranged to present problems of varying difficulty. Dunham (14) describes a new form-board. Kelley (19) describes a test which enables one to measure the initiative, originality and persistence in construction, rather than the ability to carry out set tasks. Kent (21, 22), Trabue (39) and Miles and Butterworth (27) have devised and standardized tests the nature of which is indicated in the titles of their articles. Thorndike's tests (37) deal with the judgment of geometrical form, and with the appropriateness and beauty (or

lack of ugliness) of lines of verse, which were written to complete a couplet. Haberman (15) presents a long list of unstandardized tests, classified according to assumed "mental faculties." Haines (16, 17) modifies some of the Binet tests used in the Point Scale, and adds a few others to make the scale applicable to the blind, and gives statistics. Parker (29) gives a useful description of the inaccessible Rossolimo tests. Terman's book (36) needs no identification.

Bell (2) and Bingham (3) present rather discouraging results of attempts to diagnose the ability of college freshmen. Bonser (4) has followed up several hundred of the pupils he tested in 1906 and finds their scholastic career to correspond roughly to their test rankings. Thorndike (38) finds the results of the Binet scale to correspond closely to tests of language ability, but not so closely to constructive ability, and concludes that they are one-sided.

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COLOR FILTERS AND NEUTRAL FILTERS FOR VISUAL EXPERIMENTS

BY PRENTICE REEVES

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In a discussion with a group of experimental psychologists recently the need of suitable filters for color experiments arose. As Johnson (5) stated the physicists seem to be more familiar with such filters than psychologists, although the knowledge is probably more valuable to the latter. The psychological literature is full of experiments dealing with color, but in only a small percentage of such studies have data been given as to the exact quality of the colored stimuli. In order to duplicate experimental procedure or to compare results of different experiments it is essential to know at least some of the properties of the original stimulus. It is desirable to have a source of colored light that may be duplicated in any laboratory and this may be obtained by means of a standard light source and the use of filters easily duplicated.

The lamp problem has been very well taken care of in the recent developments along that line and the filter problem has also made rapid progress. Some of the first colored filters made were designed to reduce artificial light to daylight and this work probably began with the use of blue chimneys on kerosene lamps. Much attention has been given to this subject during the past fifteen years and the article by Luckiesh and Cady (6) gives a good treatment of this subject and contains a useful bibliography. Another line of work to demand color filters has been photometry and numerous articles have been written on this subject. A set of photometric filters for use in the photometry of the various electric glow lamps is described by Mees (8) and also in the Wratten Light Filter book (14). These filters are used to reduce daylight and the lamps to

color match and may be used in various experiments where it is desirable to reproduce certain light conditions.

Throughout the literature there have been numerous articles describing experiments with various absorbing media and until recently most of the experimenters used absorption cells with aqueous solutions of various aniline dyes. But previous to the work of Uhler and Wood (10) the aims and methods were so variable that not even a complete collection of data would have given a satisfactory collection of spectra. These workers began an organized research and published their results for some inorganic substances and a long list of organic dyes. Their work centered largely on the ultra-violet and certain parts of the visible spectrum so that much of the region of the longer wave-lengths remained for other investigators. Ives and Kingsbury (4) point out the difficulties and precautions necessary in using absorption cells and on the whole we are forced to agree with Ives in an earlier statement concerning absorbing media. Ives says (3) that only two kinds of absorbing media are very practicable: colored glasses and dyed films, either gelatine or collodion. To each of these there are several objections and the practical problem as Ives saw it was in combination of the two media.

The dyed films have had two disadvantages: their absorptions are apt to be quite narrow and they are apt to be unstable, *i. e.*, fade when exposed to light. Numerous experiments have been tried on dyed film and very satisfactory results have been obtained. Hnatek (1) investigated over sixty aniline dyes and found twenty-four suitable for the preparation of gelatine filters. He defines the concentration of the color by indicating the number of grams of coloring matter uniformly distributed over a square meter of filter surface. His results, however, show that narrow ranges could be obtained only by combining several filters and in these cases the transmitted light was too faint for practical purposes. Schulz (9) used gelatine filters to isolate the bright bands of the mercury vapor lamp but unfortunately he does not describe how he obtained the filters. Johnson describes a set of available filters for use with the mercury lamp and they seem to be quite satisfactory.

Probably the most extensive work on filters was that carried on by Mees (7), and which he has continued in the research laboratory of the Eastman Kodak Company. The research was started to extend the work of Uhler and Wood and to get a complete set of filters for the visual portion of the spectrum and infra-red as well

as the ultra-violet region. In the original work Mees published data on about seventy filters and this list has been extended to nearly one hundred. The data on these filters have been collected and published in book form, so as to be available to those interested. In the publications (12, 13, 14) these filters are described and various practical uses are given. The Wratten Light Filter book is particularly valuable, as it gives complete information concerning the filters: the spectro-photometric curves; the purpose for which the filter may be used; stability when exposed to light; the per cent. transmission for wave-lengths between 400 and 700 and also the data for combinations of filters. Each filter is listed as to its stability to light. "Quite stable" indicates that no change occurs when the filter is exposed to daylight and sunlight for twelve months. "Stable" filters do not change in six months, "moderately stable" three months, and "somewhat stable" one month. A few filters will not stand exposure at all, but are so indicated in the table. The spectro-photometric absorption curves and the table of transmissions enable an experimenter to choose the filters for his special purpose and psychologists and physiologists will find in the list a large number suitable for their special purposes.

These filters may be used with light sources which are found in all laboratories, as tungsten, gas-filled tungsten, carbon and arc lights as well as special light sources. Nernst glowers and concentrated filament lamps¹ give intense narrow sources of light that are very satisfactory. For monochromatic stimuli numerous sources are available, such as sodium for yellow and lithium for red. The spectra of such sources show widely separated lines which can be isolated by means of filters. It is often convenient to use special arc lamps or spark gaps with certain elements at the terminals. The most commonly used source in this class is the mercury-vapor lamp. This lamp used with the Wratten mercury monochromats offers a very suitable monochromatic source for yellow, green, blue and violet. (Johnson suggests an auxiliary source for red; or other sources such as a cadmium or zinc spark in air could be used.) Four bright bands predominate in the mercury

¹ When using special tungsten lamps a variable resistance and a voltmeter should always be used in the circuit. A very short time on voltage higher than the rating of the lamp will burn it out. When first turning on the current the resistance should be set so that the voltage is below rating and raised gradually to the rated voltage. When permissible the lamp might be run slightly under and at no time should the voltage be allowed to remain long at over rating. The life of the lamp is also increased if run under voltage while not in actual use.

spectrum and are: yellow, 5790 and 5770;¹ green, 5461; blue-violet, 4358; and deep violet, 4078 and 4046. The yellow mercury monochromat, Wratten number 22, transmits only the yellow lines, the violet, No. 50, transmits 4358 so that it overpowers the other violet lines, number 77 filter transmits 72 per cent. of the green and only $\frac{1}{2}$ per cent. of the yellow, and filter 77A transmits only the green line. (The green line of a mercury vapor lamp is the most powerful monochromatic source known.)

The Wratten filters are prepared by coating gelatine containing a known concentration of dye upon plate glass. After drying the film is stripped from the glass and tested for accuracy of depth of color by means of a special instrument in which it is compared with filters which have been standardized upon the spectro-photometer. Only filters which accord with the standard within certain fixed limits, the extent of these limits depending upon the filters but always being less than that visually perceptible, are allowed to pass, and in this way the Wratten filters always correspond rigidly with their specifications. The gelatine film can then be used either alone or cemented between glass of various degrees of optical perfection according to the purpose for which the filter is required. Wratten filters are supplied in two standard qualities of glass. For producing color stimuli the plain film can be fastened between strips of ordinary glass, since unprotected gelatine films get soiled by handling and are apt to crack or tear. In addition to the regular filters the laboratory has a considerable stock of special filters and is prepared to coöperate as far as possible with any experimental or other laboratory. The laboratory can also supply neutral filters which transmit any per cent. of the incident light desired. These filters transmit all colors to about the same extent and are used to diminish the intensity of the light. The writer used a set of such filters in investigating the least perceptible intensity of light and the least perceptible difference under various conditions. For the absolute threshold a neutral wedge was used which was made on the same principle as the neutral filters but having a range of density from .04 to 7.5, *i. e.*, transmission from 92 per cent. to 3.2×10^{-6} per cent.

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¹ Wave-lengths expressed in Ångström units (Å. U.), one ten-millionth of a millimeter or 10^{-8} cm. Wave-lengths are also expressed in micromillimeters ($\mu\mu$), 10^{-7} cm., and microns (μ), 10^{-4} cm.

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SPECIAL REVIEWS

Character and Temperament. J. JASTROW. New York: Appleton, 1915. Pp. 596. \$2.50.

Professor Jastrow's book is undoubtedly the most extensive analytical account of character and temperament which has so far appeared. The introductory chapter calls attention to such fundamental factors as heredity and environment, central and derivative traits, the biological derivation of traits, emotional and intellectual traits, etc., which are responsible for the composite of an individual character. The author treats at some length each of these lines of cleavage. Thus he considers the causal relations of emotion, emotional expression as instinct, and emotional characteristics of conduct. One chapter contains an account of the interrelationship of social environment and the individual character. The exposition brings out no new principles, either analytical or extra-psychological.

It would promote the development of psychological inquiry concerning character traits if contributors would devote themselves

to an empirical scientific study of character by means of objective judgments with appropriate interpretative analyses, rather than to write more arm-chair philosophy about temperament. Speculative analyses on character and temperament will be justified only when we have sufficient empirical data to build upon. Even then, every analytical account should justify itself by bringing forth some new relationship. A more fruitful procedure to follow in this regard is illustrated by Webb's recent study of character and intelligence, in which its author avails himself of the best statistical methods for the specific purpose of making a contribution. If Professor Jastrow's book lacks content it is not due to any incompetence on the part of its author for his style of exposition is indisputably good, but he who attempts to write a six-hundred-page volume on an unexplored branch of psychology must necessarily find his task troublesome. The subject of character and temperament is perhaps of more far-reaching interest than any other field of psychological inquiry, but we have not as yet even formulated the proper categories by which to study it. Correlation statistics with objective measurements will be the means of gathering an extensive body of factual material on the subject and when this material is organized a popular account will be in order.

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The Psychology of Sound. H. J. WATT. Cambridge: University Press, 1917. Pp. viii + 241.

In this volume the author has given a comprehensive theory of hearing as based upon his well-known doctrine of sensory integration. The contents, after a brief preface, are an introduction followed by chapters on "Auditory Sensations and their Attributes," "The Analysis of Bi-tonal Masses," "Distance and Interval," "The Analysis of Tonal Sequences," "The Further Study of Tonal Masses," "Melody," "The Formation of Scales," "Physiological Theories," and "Binaural Hearing." In a following chapter each of the sections of the preceding is summarized in a brief paragraph, while another chapter furnishes a short summary of the whole. Then comes an "Untechnical Account of Results," and a final chapter on "'Pure' Psychology." There is a list of 159 works cited in the text, while an appendix is largely devoted to a searching critique of Köhler's recent theoretical formulations. The volume closes with indexes of authors and subjects.

Watt conceives "tone" as a volumic mass with a predominant

intensity defining its pitch. There is but one quality for all sound. Pitch is "systemic order," and is analogous to that attribute which in the cutaneous and visual senses furnishes the basis for localization. Volume, on the other hand, is "systemic extension," which in vision furnishes the basis for cognitive space. The tone is like a molecule containing various atoms. If the molecule is balanced and a central atom predominates, this gives to the whole a pitch. Among the subsidiary atoms within the mass are those that correspond to the partial vibrations, and constitute while "pitch-blends." When two or more masses of tone unite as in a chord, we have a more conspicuous overlapping of their respective volumes. "A very irregularly balanced mass of elementary sound 'atoms' in which more or less vaguely defined predominances (pitches) may appear" constitutes a noise. Vowels are reckoned between these two, as suggested by Jaensch's experiments.

Volume appears as the central feature in Watt's explanation of fusion and interval. That the volumes are graded with reference to their pitch ordinals by progressive increments from higher to lower tones. It follows that the volume of any high tone is always entirely included within the volume of any lower tone, and, indeed, in such wise that "all simultaneous tones have a common upper limiting 'atom' of sound and coincide downwards from that point in the proportion of their relative volumes. Their predominances or 'pitches' stand centrally in their volume. Fusion is determined by this coincidence and the resulting balance of the lower limiting and predominating points of the higher tone round the predominance of the lower" (p. 207). Whereas fusion rests upon the balance of resultant volume, interval depends upon the proportion between the parts of the total mass. Thus thirds and sixes are of approximately equal balance, or fusion, but they are very different intervals.

Watt argues that the musical intervals are based and standardized upon divisions of the octave which have been variously achieved and then familiarized until known. The pentatonic and heptatonic scales of Java and Siam are attributed in origin to a division of the octave by fifths from the lower and from the higher tone. This results in the scale *c-f-g-c'* with the two extreme intervals larger than the middle one. A division of the larger intervals in two leads to the pentatonic scale of equal interval, while a division in three, based perhaps upon an attempt to duplicate the *f-g* interval thrice within the larger intervals, leads to the heptatonic scale. The intervals of

the fourth and of the whole tone are regarded as guides in both cases, but the prime motive for a scale of equal temperament is always that of "complete transposibility," just as it has been in the case of our own chromatic scale. "There is in all this no contradiction with our own doings in the matter of scales. We need postulate no logarithmic inspirations or root extractions, nor do we need any mysterious 'feelings' for equal intervals. That 'feeling' is given along with the consonance of fusion in any interval" (p. 137). One might note, however, that while the derivation of pentatonic and heptatonic scales may perhaps be suggested by the "natural" division of fourths and fifths, the hexatonic or "whole tone" scale of equal temperament is not. This scale, observed by Myers among the islanders of the Torres Straits,¹ is, to be sure, less well authenticated than the scales of Java and Siam, but we know its musical possibilities from the compositions of Debussy, and should it also prove to be an "original" mode, it would seem to require a sense of equal interval quite distinct from all fusional presuppositions.

Watt rejects the conclusion of Abraham and v. Hornbostel that *distances* are judged equal when they show the same relations of vibrational frequency. "It must be evident," he writes, "that Abraham and v. Hornbostel, in the face of immense, if not insuperable, difficulty of uncovering the primary distances of pitches, have simply wandered unwittingly into mere interval, which is of course a matter of relations or proportions of volume" (p. 83). He gives the proper method of dividing the true tonal distance into equal parts as that of determining where the predominant orders of the two tones lie, and then finding what tone would have a predominant order falling just midway between these. Thus the middle pitch between two *cs* is found to be an *f*, and between *c* and *a* an *e*; between *c* and *g*, *e*^b. He admits that when we compare two theoretically equal distances we do not readily detect anything identical, though it may be there for all that, for "no matter what we do, the basis of proportion, *i. e.*, interval, and from habit the attitude towards proportion are both there; and they may well make the proper abstraction of distances impossible. Perhaps somebody will succeed with the abstraction some day" (p. 84).

Melody is a succession of notes and involves *motion*. Successive intervals are musical for the same reasons that the binary mass may fuse. "It is clear then that relations exist between successive tones that will inevitably standardize the range of successive

¹ Cf. Stumpf's *Anfänge der Musik*, note 29, p. 94.

pitches in exactly the same way as the range of simultaneous pitches is standardized by the volumic outline of tonal masses" (p. 87).

In the development of his physiological theory of hearing Watt rejects the resonance hypothesis and, regarding the basilar membrane to be very elastic, finds therein the possibility of many different depths of bulge being occasioned upon it as it is set in wave motion by the action of the stapes. The wave motion is supposed to have "a constant linear rate for all tones so that the distance traversed before the expiry of a wave is proportionate to the vibratory frequency of the tone" (p. 163). Thus the pattern of the bulge on the membrane is directly analogous to that which was used as a figure for the "molecular" form of a tone. "Every physical tone produces a wave of depression of the basilar membrane beginning from the basis and extending along in proportion to its pitch, with a point of maximal depression in the centre round which relative intensities are arranged symmetrically and decreasingly" (p. 208).

Watt's theory stands or falls on his conception of volume, yet this does not appear to be founded upon empirical evidence. When he assumes the coincidence of volumes to give a resultant pattern of balance or unbalance, he is dealing with a theoretical figure, ingenious, but not altogether convincing. Rich in his study of tonal volume¹ has found that volume differences can be readily judged on an attributive basis, and that their differential increments follow Weber's law. This result is not necessarily at variance with Watt's statement: "it seems natural that . . . volumes should really decrease evenly with rise of pitch, as they seem to do, especially since the predominance of pitch seems to be central to each volume" (p. 82). The question of distances, since they depend upon the pitch salients is somewhat more complicated. Watt's conclusion "that distances are not only not equal in octaves, but rather about halved in size for any interval with each octave upwards" (p. 82). Such a theoretical conclusion must await empirical confirmation.

The book remains an important contribution to the psychology of sound. In a most thorough and painstaking manner the author has collected and sifted a large amount of experimental evidence for the purpose of reducing it to systematic form. His conception of the tonal mass with its attributive variations, together with his rejection of a multiplicity of elemental qualities for sound, seems

¹ Cf. *J. Exper. Psychol.*, 1916, 1, 13-22.

to the reviewer distinctly promising. If the conclusions drawn from his conception of volume are somewhat less convincing, the basic notion of a volumic pattern is yet an ingenious and suggestive incentive to further experimental research.

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DISCUSSION AND REPORT

THE PLACE OF THE SELF IN PSYCHOLOGY

The following paragraphs embody the result of one of my attempts to test the claim of the self-psychologist that the fundamental conception of psychology, as stated by the structuralist or the functionalist, carries with it the implication of a *self*, which should receive open recognition as the fundamental base from which all psychological edifices are built up.

In substantiation of this view, I have traced the various steps by which I discover the implications of the definitions that are very far from being those of self-psychology. If one introspects to see what images and supplementary statements are aroused in him as he seeks to assimilate a definition, he comes upon some ideas, images, mental content, etc., which, given verbal form, become assertions. Thus, by some such process as the following, I discover what are to me the implications of McDougall's definition: "Psychology is best defined as the positive science of the conduct of living creatures." When I read this definition, I respond first to three words, "positive," "conduct," "living creatures." "Positive" calls to mind "positivism" in philosophy, and almost at the same time, a hazy mass of images related to the different sciences that I have studied. "Conduct" at first calls up the word "ethics," then vague, hasty images of various dramatic situations between selves. These I dismiss as not very pertinent to the definition, and in their place the word "activity" appears as a verbal image, and that brings with it complex visual images of various reactions to stimuli. This is accepted as pertinent. "Living creatures" calls up fragments of different animals. When I fit together these three words, in the endeavor to get a clear meaning, the definition seems to be too large to fit the desired subject-matter. But ignoring this difficulty, I may say at once that when I try to cause clear images to emerge from the words "conduct" and "living beings," I imagine some definite situation, as a frog withdrawing his leg from a lighted match, or a human being lifting weights, and uttering sounds by

which he indicates which is heavier. But invariably, even in the case of the lower animals, I add to this the question, "How does he feel as a whole?" "What does he think of his experience?" (The questions are never so explicitly put, but in significance they are somewhat like the formulated questions.) They are accompanied by, but not identified with, kinæsthetic sensations like those which one has if one imagines oneself getting on the inside of something, a house, a pipe, a sewer, or an earthworm. It would be difficult clearly and fully to introspect this mental process, even if space permitted, but it is something which accompanies all my contacts with "living creatures." Hence the definition comes to mean for me "That procedure, rich in array of facts, by which I get on the inside of 'living creatures.'" Now "living creatures," when worked on by science, could not be worked on *en masse*. One creature at a time would have to be studied.

Here we have a much abbreviated account of the processes through which a reader's mind may go in the course of his reading and assimilation of a definition of psychology. The introspection here given is very incomplete, but it touches upon the main contents of my mind, when considering McDougall's definition. Even in the case of this definition, which is so far removed from a definition satisfactory to self-psychology, the idea is conveyed that the inner life of the individual is to be studied, by means of its objective tokens of existence. The inner life, in my own case, can only be understood if it is regarded as a self. This I should call the implication of McDougall's definition. Similar steps lead me to the observation of a similar implication in the case of other definitions. In the case of certain definitions—those of Wundt and Ward, for example—the implication is observed with few or no intermediate steps. In other cases, as in that of Titchener's definition, some such steps are necessary.

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PSYCHOLOGY AND NATIONAL SERVICE

Among the many scientific problems which the war has forced upon the attention of our military authorities there are several which are either psychological or present a psychological aspect. In the opinion of experts many of these problems are immediately soluble and it therefore becomes the duty of professional psychologists to render national service by working on such problems. For this reason a committee on psychology has been organized with the

approval of the council of the American Psychological Association, by the National Research Council. This committee consists of J. McKeen Cattell, G. Stanley Hall and E. L. Thorndike from the National Academy of Sciences; Raymond Dodge, S. I. Franz and G. M. Whipple from the American Psychological Association, and C. E. Seashore, J. B. Watson and R. M. Yerkes, Chairman (member of the National Research Council) from the American Association for the Advancement of Science.

At the first meeting of the committee, it was voted "that whereas psychologists in common with other men of science may be able to do invaluable work for national service and in the conduct of the war, it is recommended by this committee that psychologists volunteer for and be assigned to the work in which their service will be of the greatest use to the nation. In the case of students of psychology, this may involve the completion of the studies on which they are engaged."

It is the function of this general committee to organize and, in a general way, supervise psychological research and service in the present emergency. Problems suggested by military officers or by psychologists are referred by the committee to appropriate individuals or institutions for immediate attention. Already at the suggestion of the council of the American Psychological Association the chief psychological laboratories of the country have been offered to the committee for such use as the military situation dictates. Moreover, the membership of the American Psychological Association, in response to a letter addressed to it by the council, has responded most promptly and heartily with offers of personal service.

At a meeting held in Philadelphia, April 21, the council of the American Psychological Association, in addition to approving and urging the appointment of a committee on psychology for the National Research Council, authorized the organization of twelve committees to deal with various important aspects of the relations of psychology to the war.

The list of committees with their personnel, so far as at present announced, follows, together with brief comment on the status of their work:

COMMITTEES

Committee on Psychological Literature Relating to Military Affairs.—It is the function of this committee to prepare bibliographies and abstracts of important psychological military contributions for the immediate use of committees, individual investigators, and for publication. Chairman, Madison Bentley, University of Illinois. Dr. Bentley already has rendered valuable service to several of the committees.

Committee on the Psychological Examining of Recruits.—The first task of this committee is the preparation and standardization of methods and the demonstration of their serviceableness. Chairman, R. M. Yerkes, Harvard University, W. V. Bingham, H. H. Goddard, T. H. Haines, L. M. Terman, F. L. Wells, G. M. Whipple.

This Committee has prepared a method of group examining, and also varied methods of individual examining. The work, covering a period of four weeks, was generously financed by the Committee on Provision for the Feeble-minded. The methods are now being tested in three army camps and one naval station. The expense of this initial trial, which is made primarily for the further development and perfecting of the methods, is met by an appropriation of twenty-five hundred dollars made by the Committee on Furnishing Hospital Units for Nervous and Mental Disorders to the United States Government. At the present writing, the Surgeon-General of the Army awaits lists of psychologists who are both adequately prepared and willing to serve as psychological examiners.

It is the conviction of the committee that the psychological examiner, by applying specially prepared and adapted methods to recruits in the camps, should obtain measurements valuable alike to line officers, to general medical officers, and to the special officers in charge of the psychiatric hospital units.

It is assumed that the work of the psychologist, although not strictly medical in character but instead vocational, educational and social, will supplement that of the medical examiner by supplying him with information otherwise not available. Further, the psychologist may aid the psychiatrist by detecting and referring to him those individuals for whom careful psychiatric examination is obviously desirable.

Committee on the Selection of Men for Tasks Requiring Special Skill.—This includes the selection and promotion of officers, as well as the choice of men for varied kinds of skilled service. Chairman, E. L. Thorndike, Columbia University, J. C. Chapman, T. L. Kelley, W. D. Scott.

A new method of selecting officers devised by Dr. Scott is now in use in many of the Officers' Training camps.

Committee on Psychological Problems of Aviation, Including Examination of Aviation Recruits.—Chairman, H. E. Burt, Harvard University, W. R. Miles, L. T. Troland.

Work looking toward the development and thorough testing of methods for the selection of aviation recruits has been authorized by the government and already is in progress in at least one of the institutions where the recruits are being trained.

Committee on the Psychological Problems of Incapacity, Especially Those of Shock, Reëducation and Vocational Training.—Chairman, S. I. Franz, Government Hospital for the Insane, J. B. Watson, K. S. Lashley.

The task proposed for this committee is a large and difficult one and the chairman plans to organize, in intimate relations with various military activities and agencies, a committee which shall be competent to deal with the varied scientific problems of incapacity.

Dr. Franz has himself developed successful methods for the reëducation of certain paralytics, and according to our information his methods are now used by the Military Hospitals Commission of Canada. It is greatly to be hoped that his own country may be equally ready to avail itself of these methods, and that it may adequately prepare in advance for the extremely important as well as difficult task of rehabilitating maimed and paralyzed soldiers and sailors.

Committee on Psychological Problems of Recreation in the Army and Navy.—Chairman, G. A. Coe, Union Theological Seminary, W. C. Bagley, H. L. Hollingworth, G. T. W. Patrick, J. H. Tufts.

This committee will serve the national cause by coöperating in every profitable way with the committee on military recreation of the Y. M. C. A., and with such other agencies as are immediately concerned with this kind of military aid. Psychologists will find abundant opportunity for the study of psychological aspects of recreational problems.

Committee on Pedagogical and Psychological Problems of Military Training and Discipline.—Chairman, C. H. Judd, University of Chicago.

Committee on Problems of Motivation in Connection with Military Service.—Chairman, W. D. Scott, Northwestern University, H. S. Langfeld, J. H. Tufts.

Committee on Problems of Emotional Stability, Fear and Self-control.—Chairman, R. S. Woodworth, Columbia University, W. B. Cannon, G. S. Hall, J. B. Morgan, J. F. Shepard.

It is probable that in addition to dealing with the special problems of emotional stability this committee will find it desirable to undertake a careful study of incorrigibility.

Committee on Acoustic Problems of Military Importance.—Chairman, C. E. Seashore, University of Iowa, R. M. Ogden, C. A. Ruckmich.

Already the chairman of this committee has interested himself in the relations of the principles of acoustics to various naval situations. Methods of localizing sounds and their utilization for the detection of submarines, the identification of guns, and the locating of batteries are clearly important. These questions are under investigation by the Physics Committee of the National Research Council, with which Dr. Seashore's committee will coöperate.

Committee on Visual Problems of Military Significance.—Chairman, R. Dodge, Wesleyan University, R. P. Angier, H. A. Carr, L. R. Geissler, S. P. Hayes, G. M. Stratton, L. T. Troland.

Chairman Dodge has devised and perfected an apparatus for the measurement of various important aspects of the naval gunner's reaction. This is now installed for trial on a number of battleships. The Committee has also been requested to prepare and recommend to the Navy methods for the selective examining of men for various kinds of service. This work is in progress and its results will shortly be reported to the officials directly concerned.

If the war continues for as much as a year American psychologists will have opportunity to serve importantly, not only in the examining and classifying of recruits but also in the selection of men for positions of responsibility, and in the choice and training of aviation recruits, naval gunners and others in skilled service. It is no longer a matter, as at first appeared to be the case, of inducing military authorities to accept methods of psychological measurement, but instead primarily one of meeting their expressed needs and requests for assistance.

As psychological research along such lines as have been indicated above progresses and as the applicability and serviceability of methods are demonstrated and rendered increasingly clear, it is probable that effective use can be made by the government of all scientists who are skilled in the study and control of human be-

havior. For after all the human factors in war are as important as are the mechanical and it cannot be doubted that brains and not brawn will decide the great conflict.

R. M. YERKES,
Chairman

NOTES AND NEWS

THE June number of the BULLETIN, dealing with psychopathology, was prepared under the editorial supervision of Dr. E. E. Southard, of the Boston Psychiatric Hospital.

THE degree of doctor of Science, *honoris causa*, was conferred upon Dr. E. E. Southard at the recent commencement of the George Washington University.

THE position of Professor C. S. Yoakum in the University of Texas has been changed from associate professor of philosophy to associate professor of psychology. J. U. Yarbrough has been appointed instructor in place of Miss Alda Barber, resigned.

THE following appointments have been made at the Carnegie Institute of Technology: B. Ruml, instructor in psychology; G. M. Whipple, professor of applied psychology and acting director of the bureau of salesmanship research (first semester only); A. J. Beatty, research assistant. L. L. Thurstone has been promoted to an instructorship in psychology. W. D. Scott will remain at the Institute during the coming year.

A department of psychology is to be organized at the University of Minnesota. Professor Robert M. Yerkes has been called from Harvard University to the chairmanship of the department. The staff, so far as announced, consists of Professor Yerkes, Associate Professor Herbert H. Woodrow, Assistant Professor Henry T. Moore, Assistant Professor Joseph Peterson, and Instructor K. S. Lashley.

FORMER and present graduate students of the Department of Psychology of Cornell University and a number of his more intimate friends among the faculty met with Professor E. B. Titchener in the Psychological Laboratory on the evening of June 22, to celebrate the completion of twenty-five years of his service to Cornell.

A volume of Studies in Psychology, edited by Professors W. B. Pillsbury, J. W. Baird, and M. F. Washburn, and published by L. N. Wilson at Worcester, Mass., was presented to him on the oc-

casion. The book contains the following papers: E. C. Sanford, *A Letter to Dr. Titchener*; M. F. Washburn, *The Social Psychology of Man and the Lower Animals*; W. B. Pillsbury, *Principles of Explanation in Psychology*; C. G. Shaw, *The Content of Religion and Psychological Analysis*; J. W. Baird, *Memory for Absolute Pitch*; R. M. Ogden, *Some Experiments on the Consciousness of Meaning*; R. H. Gault, *The Sense of Social Unity: A Problem in Social Psychology*; H. C. Stevens, *A Revision of the Rossolimo Tests*; L. R. Geissler, *The Affective Tone of Color-Combinations*; H. M. Clarke, *A Note on Recognition*; H. P. Weld, *Meaning and Process as Distinguished by the Reaction Method*; A. S. Edwards, *The Distribution of Time in Learning Small Amounts of Material*; K. M. Dallenbach, *The Psychology of Blindfold Chess*; C. A. Ruckmich, *Visual Rhythm*; L. D. and E. G. Boring, *Temporal Judgments after Sleep*; C. E. Ferree and G. Rand, *The Selectiveness of the Eye's Achromatic Response to Wave-Length and its Change with Change of Intensity of Light*; J. N. Curtis, *Tactual Discrimination and Susceptibility to the Müller-Lyer Illusion Tested by the Method of Single Stimulation*; W. S. Foster, *A Bibliography of the Published Writings of Edward Bradford Titchener*.

After the presentation, Professor Titchener responded with some reminiscences of the early days of the Cornell Laboratory, and in conclusion announced that he had declined acceptance of the chair of psychology recently tendered him by Harvard University.

THE following items have been taken from the press:

PROFESSOR E. H. LINDLEY, of the University of Indiana, has been elected president of the University of Idaho.

AT Harvard University W. F. Dearborn has been advanced to the grade of professor of education.

AT the summer session of Washington University courses are being given by D. E. Phillips, head of the department of psychology and education of the University of Denver.

DR. GEORGE R. WELLS, associate professor in Oberlin College, has been appointed to the professorship of psychology at the Ohio Wesleyan University.

PROFESSOR RAYMOND DODGE, of Wesleyan University, has been appointed to the Ernest Kempton Adams research fellowship at Columbia University.

THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

TROPISMS AND INSTINCTIVE ACTIVITIES

BY HARRY BEAL TORREY

Reed College

1. *General*.—With the exception of four brief chapters on their origin, geographical distribution, polymorphism and parthenogenesis, Buttel-Reepen's (6) book on the bees is concerned, as its title indicates, primarily with their modes of life and activities. The fifth chapter is devoted to the evolution of the bee colony. A discussion of comb structure and bee hives is followed by a chapter on various phases of the life history, and special chapters on the collection of pollen and on the manipulation of the wax plates secreted by the abdominal segments. Of especial interest to the psychologist are chapters on the senses, instincts, and psychology of the bees. A good working bibliography is appended.

Clausen and Goodspeed (9) develop a concept of hereditary reaction-systems, an extension of Mendelian concepts suggested by their studies of *Nicotiana* hybrids.

Fenn (13) finds a close analogy in alkaline gelatine to Osterhout's experiments on the electrical resistance of *Laminaria*, if it is assumed that the effect of time in the *Laminaria* experiments is to increase the concentrations of the salts in the cells of the tissue.

Holmes' (16) *Studies in Animal Behavior* will be reviewed at length in another place.

Neal (28) discusses the opposing claims of vitalism and mechanism as bases for the interpretation of individuality in organisms. He concludes that "individuality (personality) is a phenomenon not determined by the perceptual conditions only, but requiring to account for it the agency of a non-perceptual agent."

The results of experiments by Pearl (45, 46) on the effect of inhaled alcohol upon the domestic fowl and especially upon the progeny of treated individuals are especially interesting in that they apparently contradict the results of Stockard for guinea pigs. For twelve characters the offspring of treated parents either equal or excel the controls in ten. This result accords with the conclusions of Elderton and Pearson for workingmen's population and Nice's experiments with mice. Pearl attempts to reconcile his results with those of Stockard by assuming a differential effect of alcohol on the germ cells of any individual, the most vigorous cells, those least affected, tending most frequently to form the zygotes; also a difference in mean absolute vigor in the germ cells of different species, the same dosage that completely incapacitates the germ cells of one species failing to affect to a measurable degree some proportion of the germ cells of another, thus leaving them free to form normal zygotes. Caution is urged against transferring conclusions from one sort of animal to another, for instance from guinea pigs (Stockard) to man.

2. *Tropisms and Allied Phenomena*.—As a result of his experiments on the rheotaxis of *Asellus*, Allee (2) finds a suggestive relation between the chemical activity of certain cations and their effect on rheotaxis of isopods. Potassium is the most effective in increasing the positive reaction in *Asellus*, and the most stimulating. Its depressive effect is toxic, in contradistinction to the depressing effect of calcium which depresses rheotaxis long before toxic symptoms appear. There is a marked antagonism between potassium and calcium chlorides in their effect upon rheotaxis. Acids, alkalis and cane sugar, in the concentrations used, decrease positive reactions. Measured by susceptibility to sodium cyanide, the rate of metabolism of *Asellus* is increased by potassium chloride, which increases positive rheotaxis, and decreased by calcium chloride, which decreases positive rheotaxis. The rheotactic reaction of *Asellus* can be controlled by varying the oxygen and carbon dioxide tension within the limits found in the two classes of habitats.

Allee (3) concludes that the different rheotactic reactions exhibited by *A. communis* from certain pond and stream mores respectively are not due to differences in the salt content of the water from the two localities.

Buddenbrock (5) attacks what he regards as the "tropism theory of Jacques Loeb" by a series of arguments and citations of fact not unfamiliar to controversialists in this field.

According to Cole (10), *Drosophila ampelophila*, when creeping, reacts negatively to gravity, to a centrifugal force equal to or slightly greater than gravity, and to air currents without regard to other stimuli. This is believed to be determined by a muscle sense, the effective stimuli being due to tensions in the legs and received by the sensory nerves of the leg muscles.

Dolley (12) concludes from his experiments on *Vanessa antiopa* that the orientation of this butterfly is not wholly dependent upon the relative intensity of light on the two eyes. He bases this conclusion on various observed facts which indicate also that the path in the nervous system along which the impulses travel is not permanently fixed.

Hess (15) reports upon the accommodation reaction and mechanism in alciopid eyes, the sensitiveness to light of the ambulacra of *Astropectinids* and measurements of the motor sensitiveness of various animals to light. From the last, the author concludes that various animals are color blind, including the butterfly finch which is brilliantly ornamented on breast and tail with blue. Other experiments, he believes, refute the assertion that heliotropism of plants and animals is identical. His criterion here is questionable—namely, the region of the spectrum to which the organisms respond.

Loeb and Wasteneys (21) have reëxamined the applicability of the Bunsen-Roscoe law—whereby the heliotropic effect is determined by the product of the intensity into the duration of illumination—to the phenomena of animal heliotropism. Using a method differing somewhat from those previously published by Loeb and Ewald, they obtain results that harmonize with the former conclusions of the authors just mentioned, namely, that the Bunsen-Roscoe law is the correct expression of the influence of light upon the heliotropic reactions of *Eudendrium*.

According to the observations of Mast and Lashley (22) *Paramecium*, *Stentor*, and *Spirostomum* do not produce a continuous feeding cone. In rotifers the feeding cone appears to be continuous. In none of these cases does it appear to be of appreciable value in providing a warning of unfavorable environment ahead.

Commenting on a recent paper by Mast, Moore (24) calls attention to a previous paper in which it is pointed out that the orientation of *Gonium* in a galvanic current is due to differences in the activity of the individual flagella of each cell. Any analysis of the phenomena of orientation in *Gonium* must, he believes, include a consideration of this fact.

Moore and Kellogg (25) find that the constant current produces in *Lumbricus terrestris* an increased tension of the longitudinal muscles on the kathodal side of the worm, throwing the latter into the form of a U open toward the kathode. This result is in harmony with observations on various other organisms and accords with Loeb's theory of galvanotropism.

Olmstead (30) finds that *Planaria maculata* varies its response to gravity according to its previous experience with light and food. Unfed individuals which have been in the light are positively geotropic when placed in the dark. After several days, they become indifferent to gravity. Fed individuals taken from the light, are likewise positively geotropic at first, but negative after two days and indifferent after five days. Individuals in the dark for some time and fed continuously are negatively geotropic. These facts suggest the view that the individuals which are found under rocks, ventral side uppermost, are only those that have been feeding.

Reese (50) observes that when white light from above—or below—strikes the crimson spotted newt, the response is negative, in ordinary temperatures, indifferent in temperatures near 0° C. and 36° C. When light falls from the side, the response, whatever the intensity of the illumination, is positive at ordinary temperatures, inhibited or reversed at temperatures near 0° C. Placed between two lights of different intensities, the newts tend toward the less intense light when the intensities are relatively high, toward the more intense when they are relatively low. The animals react to a beam of light with a diameter greater than 5 cm. thrown on various parts of the body. When the light comes from the side, the response is positive.

Schaeffer (51) concludes, from various experiments, that *Amoeba* (1) "senses small particles of insoluble substances, such as carbon, glass, silicic acid" at a distance; (2) reacts both positively and negatively to tyrosin grains; (3) forms food cups under stimulation by weak solutions of both egg albumin and peptone.

Schaeffer (52) reports a series of experiments on two species of *Amoeba*, noting the feeding reactions of each to carmine, india ink and uric acid grains, and solid egg white.

Schaeffer (53) has supplemented his previous account of the feeding reactions of *Amoeba* by observations on the reactions produced by various isolated and compound proteins.

Schaeffer (54) concludes that beams of light and of darkness are sensed at a distance by *Amoeba*, positively and negatively, in the respective cases; the response varying with circumstances.

Walton (57) finds that light has an activating effect on the ciliary apparatus of *Paramecium caudatum*. The rate of locomotion varied in his experiments from 3 cm. per minute in an intensity of 5.1 candle meters to 8 cm. per minute in an intensity of 1,422 cm. When the intensity was suddenly changed from one extreme to the other, no change in the response of the animal appeared for perhaps two minutes, after which the normal response for the given intensity was gradually reached. Among conjugating individuals the degree of the response was greatly diminished or entirely lacking in about forty per cent. of the cases.

Wenrich (60) finds that some molluscs, such as *Anodonta* and *Pecten* are sensitive to decreases in light intensity only; others (e. g., *Mya*) are sensitive both to increases and decreases; and still others (e. g., *Cumingia*) to neither. Responses are affected by various physiological states. The sensitive areas are always pigmented. The reaction to an increase of light intensity in some cases is a withdrawal of the siphon tube, while reaction to a decrease differs from this in being a closure of the siphonal openings. Evidence is found for the view that the eye of *Pecten* may form an image.

3. *Actinian Behavior*.—Parker (31, 36) describes four effector systems in *Metridium*, the mucous, nematocyst, ciliary and muscular systems. The first three are independent effectors, not controlled by a nervous mechanism. The muscular system shows a variety of conditions. Some muscles are independent effectors; others are activated by nerve impulses. Non-nervous muscular responses are sluggish as compared with nervous muscular responses. Certain well-individualized reflex mechanisms exist.

From experiments Parker (32, 38) concludes that there is a widely diffused nerve net in *Metridium*. Connections are established from ectoderm through mesoglea to endoderm in many places, less readily through the lips than elsewhere. Evidence for a certain degree of specialization in the transmission system, between tentacle and mesenteric muscles, indicates relatively independent transmission-tracts—"a first step in the kind of differentiation so characteristic of the nervous organization in the higher animals."

Experiments on the tentacles of *Condylactis* lead Parker (33, 39) to conclude that the actinian tentacle, in contradistinction to such appendages as those of the arthropods or the vertebrates, contains a complete neuromuscular mechanism by which its responses can be carried out quite independently of the rest of the polyp. The chief

nervous layer appears to be in the ectoderm, the fibers extending predominantly toward the base of the tentacle.

Parker (34, 40) finds that locomotion in actinians, which has no relation to the secondary axis of the column, is accomplished by wavelike movements of the pedal disk mechanically identical with similar movements of snails. It is aided by the secretion of slime from the disk surface. The waves are produced by three sets of muscles which act on fluid filled spaces in the pedal region, producing a slight internal pressure. The entire neuromuscular mechanism necessary to locomotion is contained in the pedal region alone. The oral disk is not essential.

The observations of Parker (35, 41) support the view that an actinian possesses a low degree of organic unity, being organically more nearly a sum of parts than a unit. Though modifications of response to repeated stimulation may be readily induced, they are referable, not to associational processes, but to sensory fatigue, as in the behavior of the oral cilia and the feeding movements of the tentacles. Though *Sagartia* exhibits in its retraction and expansion a well-marked tidal rhythm, and *Metridium* a well-marked nycthemeral rhythm, neither rhythm persists after the removal of its rhythmic stimulus. In no case has an actinian shown evidence of associative capacity.

Parker (37) and Parker and Titus (42) distinguish four types of muscular mechanism in sea anemones. The first is seen in the longitudinal muscle of the acontium, which responds normally to direct stimulation; the second in the circular muscle of the column which seems to be open to direct stimulation and also under nervous control; the third in the longitudinal muscles of the mesenteries, which are controlled primarily by nerves; the fourth in the transverse muscles of the mesenteries, which respond as in a true reflex when tentacles or lips are stimulated by food. These action systems are variously combined, often highly coördinated, though the nervous system lacks obvious centralization.

Parker and Titus (43) note thirteen fairly well defined muscles or classes of muscles in *Metridium*, representing four types of organization named in the probable order of their phylogenetic development: independent effectors, simple receptor-effector systems which may respond with or without nervous stimulation; more highly specialized receptor-effector systems which respond only through nervous stimulation; complex receptor-effector systems probably including intermediate elements in the form of a conducting

nerve network. The nervous elements are found in ectoderm, endoderm and mesoglea.

4. *Synchronal Behavior*.—Allard (1) has observed synchronous flashing of fireflies in Massachusetts. Both flight and flashing seem to depend more or less on atmospheric conditions.

Craig (11) examines critically a number of alleged cases of synchronism in the rhythmic activities of various animals, including synchronous flashing of fireflies and chirping of crickets. He finds no satisfactory evidence save in the last case; and there it is doubtful whether the synchronism is due to accident or influence of environment, or a lock-and-key adaptation by which one cricket stimulates another.

Laurent (20) believes that what had appeared to him to be the synchronous flashing of fireflies was in reality caused by the twitching or sudden lowering or raising of the eyelids.

McDermot (23) fails to note synchronous flashing, as reported for American *Lampyridae* (Morse, 27) in any of the nine species studied, with the possible exception of *Photuris pennsylvanica*, a difficult form to observe accurately.

Morse (27) refers to his observation previously recorded (*Science*, 43, 169) of many fireflies flashing in perfect unison; also to similar observations by Shelford in Borneo and H. C. Bumpus in Massachusetts.

Newman (29) reports observations on the behavior of a large colony of "harvestmen" that suggests a possible explanation for the synchronous flashing of fireflies. Hanging from the under side of an overhanging rock, the individual broke into a curious rhythmic dance at his approach. The same result followed poking the colony with a stick. The rhythm, not perfect at first, became so in a few seconds. It appeared to depend on the close interlocking of the legs of neighboring individuals.

5. *Instinctive Reactions Not Included in 3 and 4*.—Bingham (4) relates two anecdotes of bird dogs who assumed the setting posture on crossing the trail, the one of a snapping turtle, the other of a sluggish land tortoise. On reaching the end of the trail, the dog in each case turned away with indifference from the trail maker.

Goodale (14) describes the behavior of five capons that readily accepted and brooded several chicks each. This they did without first becoming broody, as hens usually do. Three of them clucked much like a hen. One of them attempted to tread a chick at various times, though never observed to do so with hens later con-

fined in the same pen. Though Brown Leghorn hens seldom become broody, and then for a short time only, while Rhode Island Red hens with few exceptions become broody during the first year and make excellent mothers, the Brown Leghorn capons mothered their broods quite as well as the Rhode Island Reds. The author concludes that the brooding instinct of the capon cannot yet be cited as proof of the assumption of a female secondary sexual character by a castrated male.

Langley (19) attempts an interpretation of the coloration of tropical fishes on a strictly objective basis. While undermining many speculative explanations of animal coloration in terms of natural selection, his observations emphasize the common occurrence among animals of attributes of apparent advantage to them.

Moore (26) proposes a method of testing the strength of instincts. The method is an ingenious form of association test, based on ten instinctive tendencies of great practical importance.

The discussion by Rasmussen (47) of current theories of hibernation leads him to the conclusion that they are not only numerous but diverse and inadequate. Though various physiological changes accompanying hibernation are known, the controlling causes of the phenomenon remain uncertain.

P. and N. Rau (49), describe the nuptial swarming of *Colletes compactus*, the nesting and other habits of the solitary bee *Calliopsis nebraskensis* Cfd., and the homing of a leaf cutter, *Megachile brevis* Say.

Shannon (55) contributes an interesting discussion of the migration of various insects along well-marked routes also followed by birds. Among these insects are butterflies, dragonflies, a bumble bee, deer flies, flower flies (*Eristalis* and *Syrphus*). Insect-eating birds begin their migration early along with dragon flies. This coincidence suggests that they may follow their insect food southward. Conclusive data are wanting.

According to Weese (59) *P. modestum* reacts to air evaporation with an optimum of 1.5-3 c.c. per hour; to air temperature with an optimum of 30° when the evaporation rate is 3 c.c. per hour; and most definitely of all to substratum temperature with an optimum of 36° to 40°, burrowing taking place at the upper limit.

Young (61) has tested the theory of protective coloration during the last six years by numerous experiments, with crows, hawks, owls, domestic chickens, prairie chickens, grackles, kingbirds and martins as preyers, and several kinds of mammals and insects as prey. He

concludes that protective resemblance is effective in protecting motionless animals from attacks by caged birds, but that stillness is probably a more important factor than color in protecting animals from their foes.

6. *Nervous System and Sense Organs*.—It seems clear from the experiments of Cary (7, 8) that the marginal sense organs of *Cassiopea* accelerate regeneration in this medusa, partly through activation of the subumbrella musculature, partly through the influence of the sense organs on general metabolism.

Johnston (17) is strongly inclined to believe, from experiments on three species of turtles, one species of lizard and one alligator, that reptiles possess a general or somatic pallium in which definite sensory and motor areas are to be distinguished. This occupies an area on the dorsal surface of the olfactory bulb; dorsally near the olfactory peduncle and on the lateral border of the hemisphere in its anterior two thirds.

King (18) concludes that rats of very small weight at birth may appear vigorous and healthy during their growth period and in their adult state, which are nevertheless unquestionably subnormal in size of body and central nervous system. These may be produced occasionally in small or medium sized litters. These "runts," lacking in both reproductive vigor and growth capacity, may appear in very large litters, or when the mother is not in good condition during the gestation period.

Rasmussen and Myers (48), after comparing the chromophilous substance of the brain cells of woodchucks killed, respectively, before, during and after hibernation, find no diminution in its amount during hibernation, and no modification in the Nissl granules characteristic of the hibernating state.

Thompson (56) finds no differentiation between the brains of males and females of any caste or stage of *L. flavipes*. What little difference there is between the brains of the different castes and stages is most marked in the optic lobes, the size of these parts being correlated with the development of the compound eyes, hence large in sexual nymphs and adults, greatly reduced in workers and soldiers. The termite brain is very similar in structure to the brain of ants, save as to the mushroom bodies which are simpler and more primitive than in the latter. It is suggested that the frontal gland may have arisen phylogenetically from the median ocellus now lacking in termites.

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SENSORY PHYSIOLOGY OF ANIMALS

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The appearance of papers by Polimanti and Seffrin seems to mark an increasing appreciation of direct methods for the study of sensory physiology of animals. From the standpoint both of accuracy and of economy of the experimenter's time the use of instinctive responses is superior to special training methods. This is particularly true for the determination of thresholds. It is questionable whether dependable results bearing upon differential sensitivity can be obtained from the direct reflexes, although the possibility is well worth the most intensive investigation. The hypothesis that the reflex arc must react as a whole seems to demand some initial differentiation of reaction to any stimuli to which the organ-

ism can form differential habits and data obtained from the study of reflexes in this relation will gain additional value from its bearing upon the theories of objective psychology.

General Studies.—Burnham (8) reviews a number of theories of the origin of nervous integration, particularly the studies of Kappers and Bok and concludes that both in phylogeny and ontogeny the growth and connections of neurones result from the direction of impact of stimulation. The importance of such a conclusion needs not be pointed out. But Burnham disregards the more trustworthy evidence against somatic induction, for predeterminism in the development of the nervous system, and for the permanence of synaptic connections, so that his conclusions seem, to say the least, premature.

Coghill (9) gives detailed descriptions of the early development of the afferent cranial nerves of *Amblystoma*, which contain data wholly incompatible with the foregoing theory of neurobiotaxis. With the anatomical studies he correlates the behavior of the embryos up to the early swimming stage. The threshold to mechanical stimulation is lowest in the region supplied by the spinal nerves, next in the region of the vagus, and highest in that of the trigeminal. The areas were all equally sensitive to acid. Sensitivity to light begins with the initiation of the swimming stage when the optic nerve first connects with the brain and while the retina is still in an embryonic condition. No olfactory reactions were obtained, although the olfactory fibers are far developed and no evidence of function of the auditory sac or of the lateral line system was found, though the nerve supply of the latter is more fully developed than the general cutaneous innervation.

Goebel (11) describes the sleeping movements of a number of plants. They are excited by mechanical, thermal, hygroscopic, and photic stimuli. Summation occurs with both like and unlike stimuli and with repetition adaptation appears. Stimulation of the roots by drying the soil is transmitted to the leaves. The adaptive value of the phenomena is discussed.

Mechanical Sensitivity.—For mechanical stimulation of hollow viscera Hammesfahr (12) introduces pieces of iron, allows recovery from the operation, and then moves the iron about with a powerful magnet. He describes an electrode to be inserted permanently into deep-lying tissues, terminating in a knob over which the skin is closed. The induction current is led through the skin to the electrode and thence to an indifferent electrode on some distant part of the body.

Sensitivity to Chemicals.—Using a membrane behind which solutions could be rapidly changed Löhner (22) tested the sensitivity of the leech to gustatory stimulation. Pure water and physiological salt solution were taken; salt solution, 7 per cent., cane sugar, 5 per cent., quinine, 0.08 per cent., hydrochloric acid, 0.09 per cent., and potassium hydroxide, 0.08 per cent. in solution were rejected.

Changes in respiration were employed by Seffrin (29) as an index to the threshold for olfactory stimulation in the dog. Pure chemicals and extracts of animal tissues were used. To the former the dog tested (a ten-year-old male Spitz) did not react unless the odor was above the human threshold. To dog blood and urine and to extracts of rabbit, roe, and beef flesh he gave marked reactions when no odor was perceptible to the experimenter.

Holt (14) found it possible to stunt the growth of the olfactory bulbs of the rat by defective diet or to enlarge them by exercising the animals. Variations in size were correlated with changes in cell size and not in cell number.

Static and Auditory Sensitivity.—Lehr (21) describes the structure of the Johnston organs in the second joint of the antenna of the beetle, *Dytiscus*, and discusses briefly their possible auditory function, concluding that they are more probably proprioceptors, giving differential sensitivity to the direction of movement of the antennæ.

Nichols (25) gives experimental evidence to show that the reflex control of the flexure of the body of cartilaginous fishes is in part controlled by the action of Reissner's fiber upon sensory cells in the subcommissural organ and central canal of the spinal cord. Bierbaum (5) describes the structure of the internal ear in 26 species of deep-sea fishes. Körner (20) gives a critical review of recent experiments on hearing in fishes, finding no unquestionable evidence that they react to vibrations of the water of a frequency approaching that of sound. He then reports observations of his own on the catfish, in which sounds were produced both above and under water. Contrary to the observations of others he found that the fish never gave any reaction to the sounds.

Vitali (30) considers the function of a sense organ which he has described from the middle ear of the pigeon. Cauterization of the organs leads to an atonia of the wings which may be great enough to prevent flight. He concludes that the organ is stimulated by changes in the density of the air (arguing from structure only) which reflexly affect cerebellar tonus.

Burlet and Kleijn (7) describe the angles made by the otolith

membranes with the chief planes of the skull in the rabbit as determined from reconstructions. Peterson (26) points out the importance of Huter's data on audition in the rat and suggests that the distinction between noise and tone may be due to a lack of resonance in the structure of the cochlea. Muller and Weed (24) find that the falling reflex occurs in the cat after the destruction of the labyrinth and after blinding, but not if both labyrinth and eyes are prevented from functioning. Little interference with the reflex resulted from destruction of the excitable areas of the cortex but the reflex did not appear after total ablation of the cerebrum.

Sensitivity to Light.—Walton (31) reports that 55 per cent. of the paramecia studied by him react to light by swimming at a rate which is directly proportional to the intensity of illumination. In 2 per cent. movement is inhibited by light. Changes in the rate of swimming occurred only after continued exposure to a given light intensity. It does not seem certain that the technique employed precluded changes of temperature as well as of light intensity so that the experiments are not quite convincing.

Mast's study (23) of the relative stimulating effects of different wave-lengths of light upon the reactions of lower organisms marks a real advance in the technique of this problem in that spectral lights of known energy were employed. The limits of sensitivity and the curves of relative stimulating effect of the light throughout the spectrum were determined for a number of protista and for blow-fly larvæ and for the earthworm. The majority of the organisms showed the region of maximum stimulating effect at about $\lambda = 480\mu\mu$ with a range from $\lambda = 420\mu\mu$ to $\lambda = 540\mu\mu$. For a second group the region of maximum effect was at a shorter wave-length, with the spectrum much shortened at the red end. In the distribution of the organisms in these groups there was no correspondence with the phylogenetic relationships.

Bovie (6) finds reactions in amœba and infusoria to light of from $\lambda = 200$ to $\lambda = 125\mu\mu$. These consisted of contractions in amœba and increased, followed by decreased, rate of swimming in infusoria.

Kepner and Taliaferro (19) describe the eyes and ciliated pits of the thigmotactic flatworm, *Prorhynchus*, and compare them with the organs of free-swimming forms. Fasten (10) describes the eye of the larvæ of a parasitic copepod.

Jörschke (18) gives a systematic description of the eyes of 13 species of orthoptera and 6 termites. This is followed by a discus-

sion of the relation of the development of the facette eye to habitat, to light, to the development of the olfactory organs, to rapidity of movement, and to protective coloration.

Polimanti (27) enclosed larvæ of *Bombyx mori* in double-walled glass vessels, so that light had to pass through color filters to reach them. He counted the rate of pulsation of the pulsating vessel. This was determined for total radiation, then with four color filters ranging from violet to red. The rate of pulsation varies with the light intensity. When first placed in the filters the larvæ showed a slight increase in the rate of pulsation, progressively less from violet to red. After two hours in the filtered light all showed a marked reduction in rate of pulsation without any difference corresponding to wave-length. The rather surprising conclusion is that the insects are color-blind. Hess (13) reflected two lights from opposite directions into a cage in which bees were confined and determined their relative stimulating effect from the collection of the insects at one or other end of the cage. He concludes that the threshold of the bee for differences of intensity is as low as that of man. Substituting color papers and filters for the lights he determined the curve of relative stimulating effect to correspond to that of the color-blind man. Accepting Hess's conclusion that bees are color-blind Schwanz (28) seeks to build up a new hypothesis to explain the colors of flowers. The pigments, by their selective absorption of light, act as catalyzers in the formation of protein elements necessary for the formation of seeds.

Wenrich (32) found reactions to changes in light intensity in 13 species of molluscs. Pecten reacted to a moving card when no change in light intensity was involved. This the author interprets as evidence of image-formation. Unequal illumination of different eyes, while not probable, was not eliminated.

Arey has continued the report of his studies of the changes in various retinal elements under the influence of light and heat. The time of adaptation of pigment and of retinal cells and the effects of temperature and of anesthetics upon adaptation were tested for a variety of fishes and for the adult and larval frog. Stimulation of the skin of the frog by light when the eyes were covered did not alter adaptation (1). Migration of pigment in the retina of the snail, *Planorbis*, is induced by temperature and light. Light and cold induce movement toward the optic surface of the retina, darkness and heat the reverse. Excised eyes adapt to light but not to darkness; the latter effect is ascribed to the anesthetic effects of accumu-

lated waste products (3). In the frog the myoids of both red and green rod cells elongate in light and shorten in darkness (2). In an extensive and convincing study of the relation of the optic nerve to photomechanical changes of the retina he has shown the existence of an inhibiting mechanism, probably associated with the autonomic innervation of the eye, which prevents movements of adaptation and, antagonistic to this, efferent fibers within the optic nerve of the cat-fish which indirectly control pigment migration and movements of the rod and cone cells by counteracting the inhibitory action of the autonomic system and so permitting a direct response of the retinal elements to light (4).

Johnson (15, 16, 17) has extended his studies of visual pattern discrimination to include direction and width of striæ. He found the monkey able to distinguish differences of less than 3 per cent. in the width of alternate black and white lines and differences of from 2 to 5 degrees in direction from the horizontal in two fields exposed simultaneously. For the chick differences of 33 or more per cent. in width and of 25 to 40 degrees were necessary for discrimination. Careful tests with the dog indicated that under the most favorable conditions he is unable to distinguish striations on a field. This was true even when corrections for accommodation were made so that it was certain that the striations were focused on the retina.

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HABIT FORMATION AND HIGHER MENTAL CAPACITIES IN ANIMALS

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The year has been above the average in the number and variety of articles having to do with the comparative analysis of learning processes.

Hubbert and Lashley (9) raise the question whether the situation at the end section of the maze may acquire some character from the getting of food which makes it capable of acting like the food in fixing the next preceding section, and, similarly, the second section act in fixing the third, etc.; *i. e.*, whether learning the maze is the formation of a series of secondary, tertiary, and higher conditioned reflexes depending on the getting of food as the primary reflex. Are the errors eliminated in this order? Previous work had indicated that there is no invariable uniform progression of this kind in individual cases. Using the Watson circular maze again, they inquire whether averages will show such an order of elimination. Their results show that the errors due to passing a doorway (all of which should be entered) were much more easily eliminated than those due to making an incorrect turn after passing through the doorway; in fact there was a strong tendency to enter the doorways even without previous training; but the latter (incorrect turn) required about the same number of trials in all portions of the maze, while the former (passing a doorway) gave less trouble at the end than at the beginning of the path. They decide that this order is due to control by gross orientation, which seems to be more definite near the center than at the outside, rather than to any retroactive association.

Carr (2) has given a study of the same problem, order of elimination of errors in the maze. It is based upon results from nine mazes, several of which were of similar character, records for seven of the nine being from Miss Vincent's work. For each maze, he arranged the blind alleys in order of the average number of trials necessary for elimination, beginning with the lowest number, and correlated this order with the order of spatial arrangement in

relation to the food box. Six of the nine mazes show a positive correlation. On the other hand, if the order of final elimination is correlated with the order of the average (beginning with the largest) numbers of times the different alleys are entered during the different stages of learning, a negative correlation is found to be the rule at all stages of learning. The quickness of elimination varies inversely as the attractiveness as measured by the number of entrances, or error distribution. Error distribution is referred to three factors: (a) The tendency of the animals to make exploratory excursions with returns to the starting point, the effects of which are indicated by the fact that the three mazes which show relatively more errors near the end show few returns, and by the fact that, as the tendency to return decreases during learning, so the relative accumulation of errors near the beginning decreases. (b) Such a sensory character of the maze as an olfactory trail tended to prevent errors for a considerable distance from the start, but later the cumulative effects of such influences as curiosity and fear led to digressions and so more errors in the final cul de sacs. (c) The tendency to enter certain alleys is influenced by the peculiarities of the alleys or their relation to the preceding runs made, and, consequently, may vary with changes in the path traversed, brought about during the learning process.

One might suggest that, according to the principle of frequency, the large number of trips through the first part of the maze should lead to early elimination of the errors in that region.

Lashley (14) shows that in comparing the success of two fairly large groups of rats in learning the maze, if we rate them according to the average number of trials required to make one perfect run, we may expect that the difference in the average number of trials required to make a record of three successive errorless runs in the same day will be in the same direction and 1.304 times as large. For statistical comparison of groups there seems to be no advantage in the more prolonged training. It would probably be advisable, for statistical studies, to simplify the problem sufficiently so that a large number of animals may be trained under given conditions.

Gould and Perrin (7), in an investigation of the ability of adults and children to learn the pencil maze, give a critical discussion of the value of the curve of learning in the maze. Mere chance recovery and performance is a serious factor and we should have not only time and error records, but a study of the actual path traversed. Personal peculiarities, not essentially factors of intelligence, exert

an influence. The technique needs standardizing. The adults, all points considered, were superior to the children. The adult curve, during the first ten to fifteen trials, shows more regular and less pronounced steeples than that of the children. There is some correlation between efficiency and relatively slow rate. The good learners average a larger per cent. of all values in the first two trials, and in the first trials are doing more "analyzing, discriminating and memorizing." The children's records were prolonged, mostly by fatigue. Study of drawings made by the subjects showed some tendency towards correlation between accurate drawings and good maze records. The drawings were especially inaccurate as to cul de sacs.

Peterson (19) brings out an interesting point in suggesting "completeness" of response as a selective factor in trial and error learning. As illustrated in the maze, if an animal passes a junction into an alley, there will be a holdover impulse to go into the other path, making the activity incomplete and hesitant. If he finds himself in a blind, this overlapping impulse leads to a return along the other path; if he happens to be in the true path, this continuing tendency gradually dies out. When he reaches the food, all such remaining tendencies disappear. The divided, incomplete attitude tends to prevent the formation of the association in the blinds and strengthens relatively the connections among the successful responses.

Churchill (3) found that goldfish, although they lack a pallium, are able to learn a simple maze consisting of an aquarium cut into three compartments by two partitions with a small opening through each partition. When black bands were put around the openings, the learning became more rapid and reached a more perfect degree, indicating that vision is an important factor. It was indicated that, as the habit became automatic, the control shifted more to kinæsthesia.

In an article (8) which is an unusually interesting extension of his previous work, Hamilton gives a more complete presentation of his only-partially-solvable four-choice method of studying types of trial and error reactions, or "the qualitative aspect of non-adaptive activities." Results are obtained from an inferior class of human subjects, from a baboon and five monkeys, and from several species of rodents. No subject showed a consistent dominance of *A* reactions (attacking the inferentially possible alleys once each, not attacking the inferentially impossible alley). Human

subjects, on the whole, showed more tendency toward *C* reactions (trying all four alleys once each in spatial order) than did the other groups. *D* reactions (more than one attack upon a given alley during a given trial but with intervening attempts at other alleys) and *E* reactions (two or more successive attempts at the same alley during a given trial or persistent avoidance of the correct alley) are caused by inherently primitive reaction type, excitability, distraction and feeble responsiveness. *E* reactions were numerous among the rodents, less so among the monkeys, and least among the humans. We may study the first choice made by a subject at the beginning of each trial and inquire whether it is the same as the last entered (successful) alley of the immediately preceding trial (most recent experience) and what relation it bears to the order of frequency of entrances during all the preceding trials. If this is done, recency is found to play no part, the human subjects giving less than the normal expectation on the basis of chance, the other subjects giving, on the whole, almost exactly a chance result. Frequency of previous entrance, on the other hand, is a very important factor, the first choice corresponding to the most frequent entrance in more trials than the law of chance would indicate with over 80 per cent. of the subjects. In all of the above tests, the correct alley must be constantly changed from trial to trial. If, now, we change the experiment so that a given alley becomes invariably correct and if we make the correct alley that one which in previous trials has shown least attractiveness, then, even in spite of continued opposition of the factor of frequency, relatively few trials are necessary with Hamilton's animals to establish the correct association. Advantage is a much more potent factor than frequency or recency as such.

Yerkes (26) has devised an apparatus which combines the necessary parts so that it may be used for the study of behavior either by the Hamilton quadruple choice method, or by the delayed reaction method of Hunter, or by the Yerkes multiple choice method. He also suggests a series of problems of varying complexity which may be attacked by each method. In other articles (24, 25) Yerkes gives a digest of results which have been obtained by use of his multiple choice method, and which have already been reviewed in this journal.

Performance in the delayed reaction test by a child too young to have a system of sounds so organized as to be used as symbols is of special interest in view of the suggested use of language as an

internal factor in meeting this situation. Hunter (10) carried out such an investigation on a child thirteen to sixteen months of age. Distraction was used during the period of delay, so that bodily orientation was impossible. The child mastered a 10-seconds' delay in the earlier tests and, in the latter part of the experiments, reached a 20-seconds' interval. Many more errors were made by beginning with the left box first than with any other. Control in these tests must be by some intraorganic cues, ideational in function, and Hunter suggests that they are "kinæsthetic sensory ideas," a sort of language which develops earlier than vocal language.

Another investigation by the delayed reaction method is that by Yarbrough (22), using cats as subjects. With part of the animals, the signal or stimulus used was light, with others it was sound. When three boxes were used, the longest delay mastered by the cats was four seconds, although there were indications that, with more training, a longer interval might have been reached. When only two boxes were used, a delay of 16-18 seconds was mastered. Successful reactions were almost invariably controlled by the fact that the subject maintained a constant orientation either of its head or its body or both. No difference was found between the results with sound and those with light.

In the work of Hunter and Yarbrough (11) the T-shaped discrimination box of earlier experiments was used and the motive used was a combination of reward and punishment. Rats were thus trained to turn to the right for handclaps, to the left for silence. Controls showed that they were using the auditory cues. When an electric buzzer was sounded in place of the handclaps, the rats soon made the substitution. When a *c'* tuning fork was sounded in place of handclaps, the habit broke down and the rats could not be trained to respond to the tuning fork. After acquiring the habit of going to the right for handclaps as above, animals were trained to go to the left for buzzer, to the right for silence. It required about twice as long as to learn the original habit,—the handclap habit interfered with the formation of the buzzer habit; and yet, after the latter was acquired, the former was found to be little impaired. The two had become independent units.

A similar investigation from the same laboratory was that by Pearce on interference of visual habits in the rat (17). It was found that rats form visual habits more easily than auditory. It was found almost impossible to establish a second visual habit of opposite character, only one rat succeeding in doing so, although several

times as many trials were given as were required in the original learning.

It has been shown repeatedly that, in mastering a group of sense or nonsense material, it is better to learn the group as a whole rather than to split it into parts; but it is a question whether the whole-part laws hold in learning by the method of trial and error, as in learning a maze, and whether any laws found hold for human and animals alike. These and related questions have been investigated by Pechstein (18). A maze was used, so constructed that it could be learned as a whole or cut, by means of changing gates, into four equivalent sections numbered in order I, II, III, IV, each of which could be learned separately and then the combined whole learned. One maze was made for rats and a similar pencil maze for human subjects. The number of runs and other such conditions were kept the same for both classes of subjects. It was also possible to insert blocks at the end of each section and, by doing so after the subject had passed the point concerned, prevent returns into the preceding sections. By using different groups of subjects, results were obtained as follows. (a) The maze was learned as a whole without interference with returns. (b) The maze was learned as a whole except that returns were prevented from any one section into the preceding sections. (c) The maze was learned in sections in order and the sections then combined into the whole. (d) Section I was learned, then I-II (II not having been learned separately) then I-II-III, then I-II-III-IV. (e) Section IV is learned, then III-IV, then II-III-IV, then I-II-III-IV. (f) Section I was learned, then II, then I-II, then III, then I-II-III, then IV, then I-II-III-IV. For the rats, if we rank these methods of learning according to their efficiency, beginning with the best, the order on the basis of the number of trials required is found to be *f, e, d, a, b, c*. The order on the basis of total time required is *f, e, d, b, c, a*. The order on the basis of number of errors is *f, e, b, d, c, a*. For the human subjects, the order for trials is *f, d, a, b, e, c*. The order for time is *f, b, d, a, e, c*, and that for errors is the same. Comparison of the results from *a* and *b* suggests that retracing and entering of blinds during retracing are mostly useless and raises the question whether we should include retracing in the measurement of maze learning. Learning by the part methods is interfered with by place associations of both temporal and spatial character. On the other hand, learning later sections is facilitated by experience in the earlier—there is a positive transfer. Furthermore, even the first section

involves much less than one fourth the work required for the total maze; and, on the average, each section requires only about one twentieth the learning energy required for the whole maze. Pechstein thinks that methods *d*, *e*, and *f*, reap these advantages of the part process and at the same time meet with varying success the difficulties of place associations with their confusing and emotional effects in a distributed rather than accumulated manner, and, consequently, prove to be the most efficient methods.

The effects of massed *vs.* distributed repetitions were also tested by Pechstein for the human. The whole methods were very injuriously affected by massed effort; there is little chance that the errors of one trial will fail to appear in the following trials, and confusion is cumulative. After elimination of errors is mostly done and the problem is one of mechanization, massed trials are probably of more advantage. The part methods are either much less affected or even improved by massed learning, due to the favorable effect upon setting up connections between the sections.

In connection with the above effects of massed effort on the whole methods, the results of Lashley (15) are of interest. In maze experiments, he studied statistically the identical and diverse errors occurring in the last trials of given practice periods and the first trial of the next practice periods, and compared the results with a similar study of errors in two successive trials in the same practice period. He found a tendency for errors to be repeated from one practice period to the next and still more from trial to trial within the same period. With greater distribution of trials, there is more opportunity for these errors to be dropped.

Mrs. Yerkes (23) compared the performances of stock and inbred rats in learning the maze and in light discrimination. A combination of time and distance or error records was necessary to give an adequate representation of maze learning. In the maze work, the stock rats, on the whole, learned with less effort and greater regularity than the inbred. The inbred rats required a larger number of trials to learn the light discrimination than did the stock rats, but were able to carry the discrimination to smaller differences. The difficulties of the inbred rats seemed to be mainly due to greater timidity and sensitivity to disturbance, emotional instability.

Lashley found one rhesus monkey to be right-handed, another to be slightly left-handed (16). It was possible to modify the use of the hands by training, but whether the effects of this training would be transferred to other acts depended upon complex factors.

Kempf (12, 13) in observational studies of monkeys, finds indications of definite attempts to imitate as well as trial and error learning, and suggests that one monkey showed a "consciousness of self."

Furness (6) attempted to teach monkeys to use language. He succeeded in getting one to speak two words and apparently to attach meaning to them. They learned to match a block to another of the same color, but did not succeed in matching the block to other objects of the same color—they did not generalize.

Sutherland (21) describes an apparatus for studying complex reactions in a dog and indicates the need of closer study of concrete facts rather than general statistical summaries.

Coward (4) watching a blackbird through two seasons, found that the habit of fighting a reflection of himself in a glass persisted in spite of leading to no results. Gulls (5) when they became inland birds, changed their feeding time to the day in adaptation to the locality.

Rabaud (20) treats man in a conventional way as a member of the animal series.

Abbott (1) emphasizes the interaction of function and structure in biology and applies the suggestion to higher mental processes: since there are relations in the world, according to this, we have necessarily developed a structural basis for grasping relations.

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SPECIAL REVIEW

Studies in Animal Behavior. S. J. HOLMES. Boston: Badger, 1916. Pp. 266.

In the present work the author has brought together in readable form many of his own contributions and those of others upon the following topics: evolution of parental care (15 pages), tropisms (three chapters, 70 pages), beginnings of intelligence (19 pages), nature of learning (two chapters, 27 pages), behavior and form (11 pages), behavior of cells (20 pages), death feigning (21 pages), sex behavior (two chapters, 20 pages), and the mind of a monkey (17 pages). The book begins with a twenty-six page chapter on the

history of animal psychology from Aristotle to the beginning of the present experimental movement. Of the fourteen chapters, four are reprints. No great effort has been made to choose related topics or to treat those selected in an exhaustive manner. The book is frankly one of "Studies."

The chapter on parental care traces briefly the elaboration of this instinct from the initial stages when the eggs alone receive attention to the final stage in birds and mammals where the offspring are most carefully tended. Interesting comments are given, after Whitman, indicating the probable origin of the incubation response in birds. This behavior is to be traced back to an earlier ancestral period where the parent remains near the eggs and so protects them. Actually hovering over them is a natural subsequent stage. The warmth even of cold-blooded animals may aid the development of the eggs and later be fixed as a necessity in the warm-blooded animals. Bain is criticized for holding that the pleasure of the embrace is the basis of maternal love. The criticism, I believe, is unjust. Bain is only attempting a description of what is to him the fundamental element present in certain higher animals, notably man. He does not make this the earliest form of maternal and parental behavior nor a form characteristic of all animals.

In the chapters on tropisms the conventional material is presented. In opposition to Loeb's theory, stress is laid upon evidence obtained for *Ranatra*, *Notonectis* and *Orchestia* that the original circus movements which they manifest in response to light finally give place to straight line responses. Such a change would not be expected (Holmes) if the organisms were reflex machines. Holmes and McGraw, and Bancroft are quoted in support of the view that in many cases light acts as a constantly directing stimulus for tropic responses. Numerous illustrations of tropism reversals are given. Mast's hypothesis which refers the phenomenon to reversible chemical action is given as the best attempt at explanation. Inhibition is another possible factor at work.

The author adopts associative learning as a criterion of intelligent behavior. The origins of learning ability are traced and lead into a discussion of the factors that determine habit formation. This is the most carefully written discussion in the book. The pleasure-pain theory and Thorndike's further hypothesis of learning as "an instinct of the neurones" come in for adverse criticism. The author re-states his own view (an extension of Hobhouse's theory) that learning is a case of facilitation and inhibition, of congruous and

incongruous responses. "I have found that in the crayfish stimulation of the antennules, which are important organs of smell, sets up chewing movements of the mouth parts and grasping movements of the small chelae." "Suppose that in the chick the sight-pecking response and the taste-swallowing response are related as the feeding reflexes demonstrably are in the crayfish; the second response would thus tend to reinforce the first, and if this tendency persisted we would have a case of learning by experience" (p. 136). Frequency, recency, and intensity are not explicitly used and one is surprised that there is no mention of the recent important contributions by Carr and Watson. The "beneficial" is selected and the "injurious" is shunned on the basis not of acquired associations, but of inherited organization. "A method of blundering into success instead of attaining it directly, . . . trial and error would be of no service unless the organism were capable of turning to profit its fortunate movement. In order to do this the organism must be provided for the situation by its inherited endowment" (p. 161).

Brief interesting accounts are given of the behavior of cells within the metazoan body, of the influence of behavior in determining the form of the organism, and of sex recognition. The instinct of death feigning in its cataplectic form is traced to a prior thigmotaxis. This is also a possibility in those forms where the musculature is relaxed. Experimental data are quoted in support of this. The final chapter deals with a monkey, Lizzie, *Pithecius sinicus*. The following experiments were performed: (1) A board with an apple on it was placed outside the cage. Lizzie tried to pull in the board; but the effort required was too great. A nail was now driven in the board to serve as a handle. Immediately Lizzie grasped the nail and pulled in the board. This was frequently repeated—although not with great discrimination, because it was done even when the apple was near and not on the board. (2) Observations were made when Lizzie tried to secure food from a bottle and from a Mason jar. (3) A problem box was employed and (4) the monkey was tested for her ability to reach a suspended piece of food by employing a box upon which she might mount. The author, although writing in an anthropomorphic vein, does not credit the subject with general ideas, reasoning or even with the perception of relations. "Possibly more intelligence of the human sort would have been a positive drawback under the conditions of Lizzie's natural environment."

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DISCUSSION

THE JOHNS HOPKINS CIRCULAR MAZE STUDIES

In this paper the three monographs by Hubbert,¹ Basset,² and Ulrich,³ dealing with the reactions of the white rat to the Watson Circular Maze will be discussed. These studies are of importance in contributing to the analysis of the various factors conditioning learning ability in animals below man. References to the details of apparatus, method, number of subjects, criteria of learning, etc. will be omitted in this discussion because of the lack of space.⁴

Hubbert and Basset present valuable data concerning the effect of age and relative brain weight on learning ability. It is unfortunate, in view of this, that the studies did not utilize the statistical methods which are so necessary for a proper interpretation of such comparative data. Our criticism, therefore, is guided by the fact that no measure of the standard error is given when averages are presented and further, that both fail to indicate the degree of reliability that attaches to the differences between the averages involved in their studies.

Hubbert's monograph presents the data for five age groups. It is concluded (on the basis of a comparison of averages) that the young rats (judged by various criteria) learn more readily than the older rats. Because of the great differences between the rats in each age group it is doubtful if the conclusion is valid. For one of the criteria (number of trials necessary to learn) the reviewer has calculated the average deviations. The average number of trials for the 25-day rats was 30.4, average deviation 7.3; for the 65-day rats 30.7 ± 9.3 ; 200-day rats 41.8 ± 21.4 . The average deviation for the 200-day rats is half as large as the average! In this group the mode is 33, the median 32. The average is increased by the presence of six extremely poor rats. Omitting these, the average

¹ Hubbert, Helen B., "The Effect of Age on Habit Formation in the Albino Rat," *Behavior Monographs*, 1915, 2, No. 6.

² Basset, G. C., "Habit Formation in a Strain of Albino Rats of less than Normal Brain Weight," *Behavior Monographs*, 2, 1914, No. 4.

³ Ulrich, J. L., "Distribution of Effort in Learning in the White Rat," *Behavior Monographs*, 1915, 2, No. 5.

⁴ For a factual summary of these monographs see *PSYCHOL. BULL.*, 1915, 12, 301, and 1916, 13, 317. Also see WATSON, J. B., "Behavior, An Introduction to Comparative Psychology," New York, 1914.

becomes 32.6 ± 9.7 while there is little change in the median, *i. e.*, from 32 to 30. The fact that the median is changed so little by this omission while the average is greatly changed, justifies the conclusion that these six rats are not representative 200-day-old rats and may therefore properly be omitted from the group for comparative purposes. Miss Hubbert states (p. 29) that this group of rats was more erratic than any other group, being jerky and irregular in their movements. It is probable that this statement applies not to the group as a whole, but only to these six abnormally poor rats.

No significant difference exists between the 25- and 65-day rats. The difference between the averages is only .3 of a trial and the medians are the same. Between the 25 and 200 day rats there is a difference of 12 trials, $P.E.D. = 3.8$.¹ The difference between the average is only three times the $P.E.D.$, indicating a low reliability. If medians are used (a better measure in view of the extreme deviations in one direction) there is a difference of only two. The $P.E._{Med}$ of 4.64 actually exceeds the difference between the medians! There is a difference of eleven trials between the averages for the 65- and 200-day rats ($P.E.D. = 3.91$), a difference which is only 2.8 times the $P.E.D.$ This method of comparison presupposes normal distributions. The distribution for the 200-day group becomes normal only with the omission of the six very poor rats. The difference between the averages then becomes two ($P.E.D. = 2.0$) which is as large as the $P.E.D.$ In view of these facts it appears that the monograph yields negative results. No significant age differences are shown.

Basset's monograph can be approached in the same way. Two groups of rats (control and inbred) were compared. The average time for each of the one hundred days is given. Measures of variability of each group for each trial are not given. It is impossible, therefore, to determine the significance that attaches to the small differences between the averages for the two groups of rats in any or all of the trials. Further, these differences are probably not significant because of the presence of *two* rats among the inbred group who failed to learn in one hundred days and hence tended to raise the average for this group at all stages of learning. This criticism applies with the same force to the data for relearning.

¹ The probable errors here presented were calculated from Hubbert's data by the reviewer.

The anatomical data show the relative brain weights (brain weight in relation to body length). The differences are small and as no measure of variability is given it is impossible to determine the significance of the differences.

The inbred curve for relearning is slightly above and is slightly more irregular. This difference was probably caused by two inbred rats who failed to relearn. It is doubtful if the curves represent real group differences.

It is found, in roughly working out the medians and quartiles of the distribution according to the number of days required to learn and relearn, that there is a difference in favor of the control rats of only five days while the probable error for each median is rather large (8.5 for the controls and 11 for the inbreds). Further, the distributions for the two groups are practically the same, except that four inbred and one of the control rats are exceptionally poor. Did these four inbreds and the one control rat also have exceptionally smaller brain weights? This question cannot be answered by reference to the data.

An interesting analysis (incidentally unfavorable to Basset's own thesis) of the inbred group is made. On the whole the seven rats belonging to the seventh generation were somewhat inferior to the fourteen sixth generation rats, although the anatomical data shows the seventh generation to have the greater relative brain weight! The data for the two generations show slight differences that have little or no significance because of the variabilities involved.

In addition to the statistical criticism it seems that a more direct method of showing the relationship could have been used. The 42 rats could have been ranked according to learning ability and according to relative brain weights. Coefficients of correlation would then have shown whether the relationship was positive, indifferent or inverse.

As the data are presented and interpreted it seems that no generalization can be made. This is not equivalent to saying that a positive relationship between learning ability and relative brain weight does not exist—merely that such a relationship is not demonstrated.

Ulrich's data are especially significant and positive. The absence of overlapping of the distributions makes it unnecessary to criticize the failure to use the measures of variability and the tests

of the reliability of the differences of averages which were so essential for an evaluation of Hubbert's and Basset's data. That distributed effort is more economical than concentrated effort in learning the maze is clearly demonstrated, although it is doubtful whether there is a significant difference between the three-trial-a-day group and the five-trial-a-day group.

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THE PREFERENTIAL USE OF THE HANDS IN MONKEYS WITH MODIFICATION BY TRAINING AND RETENTION OF THE NEW HABIT

During the early part of 1915 the observations here reported were made in the psychological laboratory at Saint Elizabeth's Hospital as a part of a more extensive study of the readiness with which instinctive activity can be inhibited in monkeys. The object of this group of observations was (1) to add some data to that already obtained on the tendency towards a predominant use of the right or left hand in monkeys, (2) to ascertain the readiness with which such instinctive or habitual activity can be modified and (3) to test the permanence of such modification.¹

Six *Macacus rhesus* monkeys were used.² *A*, *B* and *F* were large males, *C* was a young female and *E* and *D* were young males. So far as is known none of these animals had been used previously for experimental purposes. The observations were always made in the morning before feeding and while the animals were in cages that have been described by Franz.³ The use of the hands was observed in three different situations.

Situation 1.—Two pieces of food were placed simultaneously upon a small shelf just outside the large meshed wires of the cage. A piece of food was put near each end of the shelf and after both pieces were grasped the monkey was chased away from the wire. After the food was eaten the next two pieces were arranged. A record was kept giving the number of times each hand was used.

¹ For references to previous work in this field see: K. S. LASHLEY, Modifiability of the Preferential Use of the Hands in the *Rhesus* Monkey, *J. of Animal Behav.*, 1917, 7, 178-186.

² These animals were obtained by Dr. Shepherd Ivory Franz with a fund granted by the Carnegie Institution of Washington, and acknowledgment of the assistance is here made.

³ S. I. Franz, Observations on the Preferential Use of the Right and Left Hands by Monkeys. *J. of Animal Behav.*, 1913, 3, 140-144.

One piece was usually put in the mouth before the second was taken. In this situation the following results were obtained. *A* showed an exclusive use of the right hand in 324 trials. *B* showed a very marked preferential use of the right hand, using it 399 times in 408 trials and *C* showed a definite preferential use of the left hand, using it 264 times in 351 trials. *D*, *E* and *F* used either hand readily, *D* tending to use the left slightly more often than the right and *E* and *F* showing a slightly greater total use of the right hand. (See Table I.)

Situation 2.—One piece of food was placed in the center of the shelf. This situation was adopted in order to further test *D*, *E*, and *F*, for in the preceding situation the two pieces of food were occasionally grasped almost simultaneously or else in quick succession, the second hand being used before the first piece of food had been placed in the mouth. One hundred trials were given to each monkey and the same ambidexterity was found, although in this situation all three monkeys used the left hand more often than the right. (See Table I.)

TABLE I

PREFERENTIAL USE OF THE HANDS OF THREE SITUATIONS: I, TWO PIECES OF FOOD ON SHELF; II, ONE PIECE OF FOOD ON SHELF III, ONE PIECE OF FOOD IN EXPERIMENTER'S HAND.

Monkeys.....	<i>A</i>		<i>B</i>		<i>C</i>		<i>D</i>		<i>E</i>		<i>F</i>	
Hand used.....	R.	L.	R.	L.	R.	L.	R.	L.	R.	L.	R.	L.
Situation I.	324	0	399	9	87	264	83	132	128	96	116	84
Situation II. ....	..	..	..	..	..	..	28	72	48	52	35	65
Situation III.	100	0	90	10	10	202	69	131	11	189	33	167
All trials.	424	0	489	19	97	466	180	335	187	337	189	316
Percentages.	100	0	96.3	3.7	17.2	82.8	39.9	65.1	35.7	64.2	36.8	63.2

Situation 3.—In this group of trials one piece of food was used but held by the experimenter in such a way that the monkey was obliged to reach up for it. The attempt was made to hold it so that it would appear equally accessible to either hand, *i. e.*, directly in front of the animal and at a level several inches above his head as he sat in a crouching position. Each monkey was given 200 trials with the exception of *A* and *B*, who gave in 100 trials practically the same result as in Situation I. *A* showed exclusive use of the right hand and *B* used the right hand 90 times in 100 trials. *C*'s tendency towards left-handedness became still more prominent in this situ-

ation. She used it 202 times out of 212 trials. On one occasion she used both hands simultaneously. *D* used the left hand nearly twice as often as the right. On two occasions he used both hands simultaneously. *E* and *F*, now showed a very definite preference for the use of the left hand, *E* using it 189 times and *F* 167 times in the 200 trials.

Period of Training.—*A*, *B* and *C* were used first. *A* and *B* were trained to use the left hand and *C* to use the right hand. The food was offered as in Situation 3 but when the attempt was made to grasp it with the wrong hand it was held tightly and withdrawn. A few seconds later it was again offered. Each monkey was given 125 trials before feeding on five successive days. Each of these monkeys tried repeatedly to grasp the food with the accustomed hand before using the other. *A* made 26 attempts to take the food with his right hand before using the left and although he was very hungry he sometimes ceased trying to obtain the food for several minutes at a time. He occupied forty-five minutes in making the 26 trials, but after once using the left hand he learned during the next eighty-eight trials to use it exclusively and on the following four days continued to use it without making a single error (see Fig. 1). *B* made 40 attempts to use the right hand before he tried the left and then during the next 77 trials learned to use the left hand, although he made an occasional error until the fifth day, when in 125 trials he used the left hand exclusively. *C* made 24 attempts to grasp the food with the left hand before using the right, but then showed the same rapid learning during the first day. On the second and third days she made a few errors but on the fourth day she used the right hand exclusively. *D*, *E* and *F*, were then trained to use the right hand. These monkeys were given 25 daily trials before feeding instead of 125. *D* tried 11 times before using his right hand and made 22 errors on the first day. On the second and third days he made 21 errors and on the fourth day 8 errors. On the fifth and sixth days there were only two errors. *E* made 25 failures the first day, 23 on the second and 18 on the third. On the fourth day there were only two. This monkey made an occasional error as late as thirty days after the beginning of the training, although there was one period of eight days during which he made no error.⁴

⁴ This was the most timid monkey of the six and it is of interest that the poor results on the eighth day (see Fig. 1) followed a severe fright. The monkey had escaped from the cage and was chased for some time before being caught in the experimenter's hands. He had not been handled previously and his squealing seemed to indicate terror.

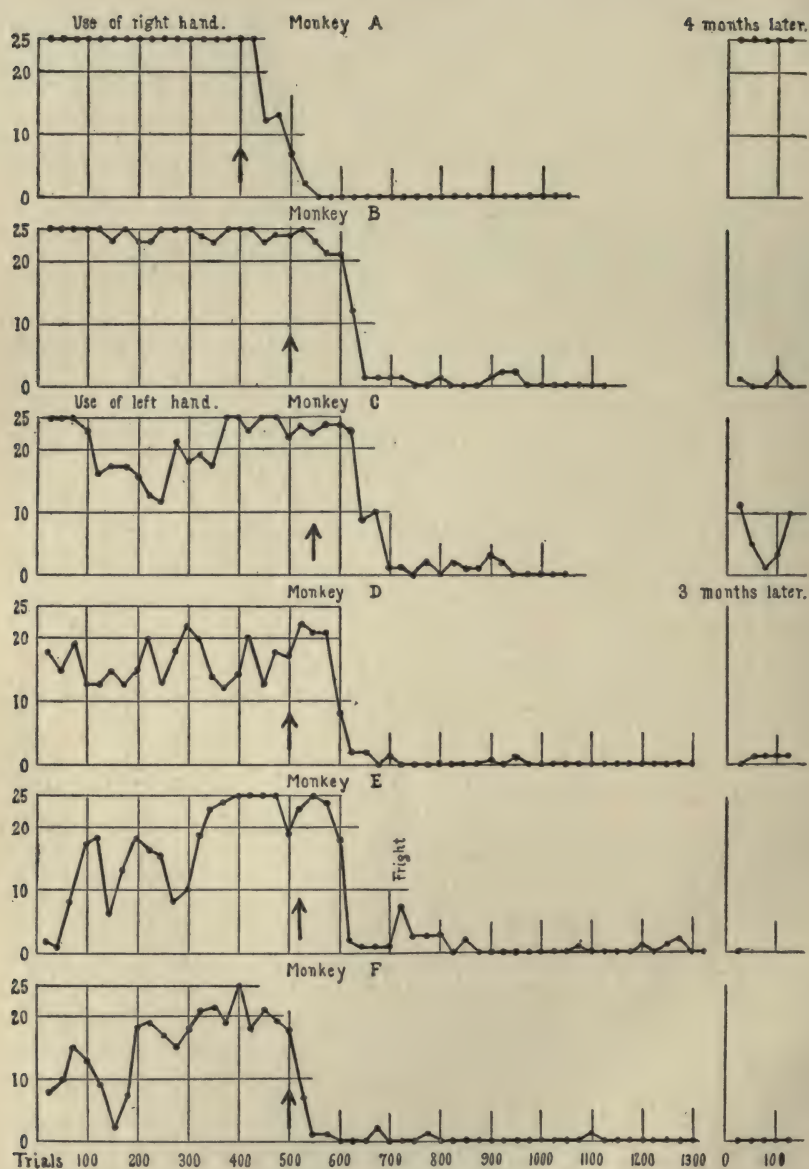


FIGURE 1. The ordinates represent the number of times that the preferred hand was used in each successive 25 trials. With *A* and *B* this was the right hand and with the others it was the left hand. The abscissae represent the number of trials grouped by 25. The arrows mark the beginning of the period of training to use the other hand. The late effect of training is also indicated.

F, who was the most ambidextrous monkey, showed the quickest learning. After the first day he only made an occasional error. The error on the eleventh day immediately followed a sudden noise made by a child just outside the window of the basement in which the experiments were conducted. The monkey turned his head suddenly towards the window and extended his left hand for the food instead of the right.

Retention of the Acquired Habit.—Four months after the end of their training *A*, *B* and *C* were tested as in Situation 3. During the interval the animals were used in another set of observations and the conditions of this experiment were not repeated. *A* showed a complete reversion to his original right-handedness, *B* showed a very good retention of the acquired left-handedness, making only three errors in 125 trials. *C* made 30 errors in 125 trials. *D*, *E* and *F* were tested three months after the end of their training and all showed very good retention of the acquired habit. *D* made four errors in 125 trials, *E* made one error in fifty trials and *F* made no error in 125 trials.

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THE
PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

MEMORY, IMAGINATION, LEARNING, AND THE
HIGHER INTELLECTUAL PROCESSES
(EXPERIMENTAL)

BY PROFESSOR J. W. BAIRD

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I. MEMORY AND IMAGINATION

(a) *Imagery*.—In an investigation of the effect of various subjective and objective factors upon the evoking of visual imagery, Burt (8) found that the arousal of visual imagery of a stimulus tends to be facilitated by increase of complexity of contour of the stimulus, by increase in its size, by increased duration of exposure, by interest, and by motor reinforcement (movements of tracing its outline). The arousal of visual imagery tends to be inhibited by mental and motor distraction. The amount of facilitation is usually greatest in the case of motor reinforcement and interest, and least in the case of increased size and lengthened exposure; individuals differ somewhat, however, in their seriation of the facilitating factors. The mode of operation of these factors differs from individual to individual. Imagery of other modalities, notably kinæsthetic, may initiate or reinforce the visual image; the participation of these factors may in certain observers be essentially attentional, while in other individuals it may be essentially perseverative. In experiments with six observers, five variations of experimental procedure, Miss Clark (11) found that changes in clearness of the visual image are usually attended by objectively verifiable eye-movements; the correspondence between amount of eye-movement and kind of image is probably due to certain condi-

tions of attention; characteristic eye-movements seem to transfer from visual perception to visual imagery. She reports that however one may classify the various types of visual imagery, it is difficult to find images of pure type, the image of each type tending to blend into images of other types. Langfeld (28) assigned to his observers the task of reciting the alphabet as rapidly as possible, omitting certain specified letters. Their introspections show that their method of inhibiting the pronouncing of the forbidden letter consisted in associating (in the fore-period) some form of inhibition with an image of the letter which was to be omitted. Sometimes the inhibition of the vocal organs was directly associated with the letter; sometimes the words of the instructions served as an intermediary; or a movement of the hand or an emotion of fear constituted one term of the association. Imagery tended to drop out as the experiments progressed, but it reappeared in cases of doubt and difficulty.

(b) *Acquisition, Recognition, Reproduction.*—Gould and Perrin (24) obtained comparative records of children and adults in learning a maze. They employed a pencil maze; ten children and fourteen adults took part in the experiments. It was found that the average records of the adults were very much superior to those of the children, the superiority amounting to twenty per cent. measured in terms of the time required to make the circuit, twenty-eight per cent. in terms of the number of trials necessary for learning the maze, fifty-four per cent. in terms of excess distance travelled, and eighty-seven per cent. in terms of number of errors. The superiority of the adult is attributed to "more effective intelligence" and to "greater motor stability." Two characteristically different learning procedures were apparent—a hurried, non-analytic procedure, and a studious, analytic procedure; but there was no consistent correlation between mode of procedure and age of learner. The more efficient learner tends to make a relatively poor record at the outset and to acquire efficiency by degrees, the result being a curve which shows a relatively more pronounced initial slope and absence of steeples. The crucial part of the learning for both child and adult is represented by the first ten to fifteen trials; the ensuing trials represent the learner's effort to perfect the route. Littwin (29) summarized a number of the familiar investigations of learning, pointing out their pedagogical applications and indicating problems for future investigation.

Strong (39) investigated the relation between recognition and

length of interval between stimulations. Four books of advertisements were employed as material. In one case these were all presented at a single sitting; in another case, only one book at a sitting and the sittings one day apart; in a third case, only one book at a sitting and the sittings a week apart. A recognition-test after the lapse of a month showed that accumulated presentations are least effective and that presentations separated by an interval of a week are most effective. Advertising space is more effective when used less frequently in large amounts than when used more frequently in small amounts. In various forms of recognition experiment, where words were employed as stimuli, Dr. and Mrs. Strong (40) found that recognitive ability is capable of enormous improvement by practice; and that ability to recognize an experience and ability to localize it temporally are approximately coincident within the first few minutes after the original experience, but that the localizing capacity decreases much more rapidly than recognitive capacity. There are indications that localizing depends upon the same factors as correct recognizing. In a modified association-reaction experiment, where the same stimulus-words were presented at intervals of five minutes, one hour, and one day, it was found that an intimate relationship obtains between difference in recognitive ability and difference in association-time. The authors conclude that the process of recognizing is conditioned by a facilitation of nervous functioning—the experience of novelty and of familiarity being respectively the conscious correlate of hesitant and of accelerated conduction across the synapse. They believe that the experience of temporal localizedness is not qualitatively different from the experience of familiarity but is only a superlative stage of the latter; recognizing is a product of a relatively rough estimate of the amount of acceleration of conduction which has taken place, while localizing is the product of a more refined and accurate estimate of the amount of acceleration.

Misses Gamble and Wilson (21) sought to determine what is the significance of place-associations in recall. They presented nonsense-syllables, arranged in certain positions upon an exposure-tablet; in the test of recall (by the method of correct associates) certain syllables were presented in their original positions upon the tablet, while others were presented in “wrong positions.” It was found that remarkable individual differences manifest themselves; on the whole, however, “right position” has a slightly greater tendency to evoke the correct associate than “wrong position,”

and to give rise to a more prompt recall. In a second experiment the same investigators presented nonsense-syllables by means of an exposure-tablet (simultaneously and with definitely spatial positions) and by means of a rotating drum (successively and with a constant and uniform spatial position), the total presentation-time being identical in both cases; in the test of recall, the stimulus-syllables were all presented in one particular position upon the tablet. Here again it was found that place-associations may be a really significant factor in recall. Of these two experiments, the former shows that the recall of one syllable by another is blocked if measures are taken to make the place-syllable associations interfere with one another; and the latter shows that syllable sequences are recalled better if the presentation is of such a sort as to foster the establishing of place-associations.

In experiments with 165 college students Gates (23) found that the average memory span for digits is 7.7 in auditory presentation, and 8.2 in visual presentation. When the length of the list presented exceeds the memory span the average efficiency of reproduction is decreased; there is, however, a type of individual (about eight per cent. of the group) whose reproduction is not impaired by the lengthening of the list. Miss Bennett (3) presented nonsense-syllables, digits, nouns and sentences in both visual and auditory fashion to nine observers. She determined how many elements of each sort of material could be reproduced immediately after a single presentation; and she also determined how many presentations were necessary in each case for a complete memorization of the material. She found a high correlation between the records obtained from the visual presentation and from the auditory presentation of each sort of material; and there are indications of a high correlation between ability to reproduce much after a single presentation and ability to memorize completely with few presentations.¹

Miss Gamble (20) investigated the relationship between rate of repetition and tenacity of impression. Lists of nonsense-syllables were presented in auditory fashion, at five different rates varying between fifteen syllables per minute and seventy-five per minute. The tenacity of association was measured by the number of repetitions necessary for re-learning after an interval of two weeks. Marked individual differences manifested themselves in these experi-

¹ The author's meaning is not altogether clear; the reviewer infers from the context that she employs the term "mediate retention" in the sense of "complete memorization."

ments; of the four observers to whose results the author attaches greatest significance, two remembered the slow series better and two remembered the fast series better. There seems reason to believe that in those cases where rapid presentation proved to be more advantageous the advantage was due to the fact that the learners found it more difficult to maintain a keen concentration of attention when the rate of presentation was slow. Myers (33) asked fifty normal-school girls to study groups of words and figures with a view to reproducing them in exact order; he permitted them to devote as much time as they wished to the task. When the learners were grouped on the basis of degree of perfection of recall, it was found that the less perfect group had devoted less time to learning the material (490 seconds as compared with 531 seconds) and that they required more time for recall (220 seconds as compared with 123 seconds). Lyon (31) aimed chiefly to determine what relationship obtains between rapidity of learning and excellence of retention; but the investigation also touches upon various subsidiary problems such as the relation between memory for coherent and non-coherent materials, and the influence of age, sex and education upon learning and retention. The author's materials consisted of digits, nonsense-syllables, disconnected words, and selections of prose and poetry; his procedure consisted in recording the learning-time and subsequently (after intervals varying from one day to ten weeks) in testing retention either by a method of free reproduction or by a method of relearning. The learners, 426 in number, ranged between fourteen and thirty years of age; and they represented various degrees of education and various levels of society—students, instructors, business men, and inmates of prisons, workhouses and insane asylums. The author finds that the relation between rapidity of learning and excellence of retention can not be stated in any single general formula. The relation varies with variation in the quality of the material to be learned, and with variation in the length of interval between learning and recall; then, too, the several methods of measuring retentiveness furnish discordant results. The following general statements seem to be justified: When material is logically coherent the rapid learner proves to be more retentive; but the converse is true in the case of non-coherent materials. Individual differences in rapidity of learning are greater than individual differences in retentiveness. Women and girls learn more rapidly but retain less efficiently than men and boys. The rapid learner tends to employ

rhythm, to make use of the whole procedure in learning, and to rely upon his natural learning-type rather than to have recourse to a multiplicity of images from unusual modalities.

Günther (26) describes a number of early memories and reports the results of an unusual opportunity to test the fidelity of one of them. He had removed from his birthplace at the age of five and a half years and had not revisited the scene until twenty-five years later. Previous to this visit he sketched a plan of the house and grounds as he remembered them; employing this sketch as the basis for a test, he found that his fidelity of remembrance amounted, after a lapse of twenty-five years, to 81.5 per cent. In an investigation of the recalling of almost completely forgotten materials, Dr. and Mrs. Myers (34) asked their six observers to attempt to recall selections of prose and poetry which they had once been able to quote, but which were now almost completely forgotten. The records of these experiments, and of an additional experiment which consisted in recalling the names of former classmates, show that the total amount re-acquired in subsequent recalls was approximately twice as much as the content of the first recall; casual suggestions from visual and auditory stimuli, and from movements, ideas and feelings, served as factors in this process of re-acquiring fragments; feeling and general attitude of the observer toward his task was an influential factor in determining the success of the attempt to recall; the recall of rhyming words proved to be of great service in retrieving the rest of the stanza; the feeling of certainty that a given recall was accurate was usually well-founded, but the subjective assurance that the observer was unable to recall was frequently ill-founded.

Conard and Arps (12) undertook to determine what advantage is derived from the use of an "economical" method in the teaching of the fundamental operations of arithmetic—the method consisting in teaching the pupil to "think results only" (for instance, in the problem $8 + 5 + 7 + 9$, to think only of 13, 20, and 29). A group of thirty-two pupils was drilled for eight working-periods by means of this economical method, while a similar group was drilled for an equal number of periods by means of the "traditional" method. A final test showed that the "economical group" were now superior by thirty-three per cent. measured in terms of accuracy, by sixteen per cent. measured in terms of rapidity. In Wells's experiment (43) two practiced typists wrote from unfamiliar copy on each of fifteen days; two experimental sittings of five

minutes' duration took place each day, at the beginning and at the end of the regular forenoon's work. The instructions for the first ten days emphasized the desirability of speed, and for the last five days they emphasized the desirability of accuracy. The chief portion of the author's discussion is devoted to an analysis and description of the various sorts of errors, which he seeks to refer to different psychical levels. In a preliminary experiment Boswell and Foster (5) presented a story and a group of objects to each of two classes, in one case with the instruction that recall would be tested after twenty-four hours, in the other case with the instruction that the test of recall would be deferred for several weeks. In both cases, however, the test took place after several weeks, when it was found that those individuals who had learned for purposes of temporary retention were less successful in recalling the material than those who had intended to retain it for a longer period of time. In a second experiment, pairs of English-Chinese words were presented; and here again the learners were instructed in certain cases that the list was to be learned for temporary retention, while in other cases they were instructed that it was to be learned for permanent retention. The recall of all of the lists was tested (by the method of correct associates) after an interval of five minutes, and again after an interval of two weeks. The results show that slightly more of the "temporary series" than of the "permanent series" could be recalled after five minutes, while after two weeks the ability to recall the "permanent series" was slightly superior to the ability to recall the "temporary series." Remarkably enough, however, the recall-times show the opposite relation—after five minutes, recalling was slightly more prompt in the case of the "permanent series," but after two weeks it was slightly less prompt in the case of the "permanent series." The introspections of the observers revealed no constant or uniform differences between the modes of learning or the modes of recall in the two cases, although several observers reported that in the "temporary series" they were more concerned with the establishing of meaningful associations. Peterson (36) presented lists of words to classes of university students, in one case having the words copied without intent to learn, in the other case with intent to learn. Retention was tested by a method of free reproduction, immediately after presentation and again after an interval of two days. The results show that intent to learn is an influential factor, and that its effect upon delayed reproduction is considerably greater than upon immediate

reproduction—the increase in memorial effect being fifty per cent. in the former case and twenty-two per cent. in the latter case. The author believes that the effect of the intent is due to a difference in the degree of definiteness of the response-attitude in the two cases, and that the more definite response-attitude facilitates the establishing of certain definite associations.

Brugmans and Heymans (7) confirm Brown's finding¹ that less time is required for the reading of a list of color names than for the naming of a list of color stimuli. In supplementary experiments they found that the reading-time for words and digits is less than the naming-time for the corresponding objects; and that while the reading-time for unfamiliar symbols is longer at the outset than the naming-time for the corresponding objects, it soon becomes less as the result of practice. From these and other experimental findings the authors conclude that this difference in time required for reacting to verbal and to non-verbal material can not be explained from a difference in practice nor from a difference in the strength of the associations involved, as has been held by other writers; they believe, too, that Brown's assumption of a radical difference in physiological processes involved in the two cases does not contribute to a solution of the problem. Brugmans and Heymans, on the contrary, hold that the phenomenon is due to the fact that the reading attitude differs essentially from the naming attitude, the former giving rise to associative processes whose direction of conduction is more definitely determined toward a specific goal. When a verbal stimulus is presented it appeals to the reagent as a word to be pronounced; the associations aroused are therefore more definitely determined as to their direction, and hence they function more promptly in evoking the appropriate speech-movements. But when the stimulus is of a non-verbal sort its associative resultant is distributed instead of being concentrated in a single direction—for instance, a color stimulus may recall any object of similar color in nature or in art; and since in consequence of this multiplicity the associations tend less to issue in a single direction, interference is more likely to occur and the response is less prompt.

(c) *Practice, and the Transfer of Training.*—Since efficiency improves with practice, Fernberger (17) raises the question as to how many determinations must be made in an anthropometric test, and

¹ W. BROWN, Practice in Associating Color Names with Colors. *Psychol. Rev.*, 1915, 22, 45-55; summarized in this BULLETIN, 1916, 13, 347f.

how much practice should be acquired before one can be sure that the measurement of the subject's sensitivity is accurate and reliable. An investigation of this problem indicates that in lifted weights fifty determinations upon each comparison-pair is the minimum number upon which a measurement of sensitivity can safely be based. Boring (4), however, points out that the importance of practice consists not so much in its effect upon the magnitude of the limen as in its effect upon constancy of judgment; and he holds that in view of the extreme diversity of purpose for which limens are determined, it does not seem safe to place an arbitrary limit upon the number of observations. Harris (27) published data concerning 15,200 estimates of the number of objects contained in groups. The three observers were able to compare their estimates with the true value, and thus they had an opportunity to profit from their experience. An analysis of the data shows that experience seems to have but little influence upon personal equation, but that it tends to give rise to a greater steadiness of judgment. In Phillips's experiment (37) pupils in each grade, from the fourth to the eighth inclusive, were asked to add continuously (or to subtract or to multiply continuously) for a period of ten minutes, the score for each minute being recorded separately. It was found that from six to twelve per cent. more work is accomplished in the first minute than in any of the subsequent nine minutes, from which the author infers that an individual's ability in the fundamentals of arithmetic may be determined from what he accomplishes in one minute of work.

Chapman and Miss Hills (9) publish records of weekly tests of efficiency made upon 100 members of a typewriting class in a school of commerce. They find that negative acceleration in improvement is not an invariable characteristic of the curve of learning; positive acceleration (concavity of learning-curve) was found to be a frequent phenomenon and to continue through as many as sixty hours of practice. Murphy (32) undertook to discover what effect various distributions of practice have upon the acquisition and the retention of skill. Groups of normal-school students practiced throwing a javelin at a target, one group practicing five times a week, another group twice a week, a third group once a week. Unfortunately, the scores obtained by the various groups are incomparable with one another, and hence they do not throw any light upon the author's problem. In Thorndike's investigation (41) sixty-four educated adults practiced writing the

products of numbers—the practice, which entailed the writing of 3,840 products, being distributed differently for each of the six groups. The practice was preceded and followed by a test of efficiency. Improvement was found to be universal and large, amounting to an increase of one hundred per cent. of performance and a decrease of fifty per cent. of error. It turned out that when 640 multiplications are made in a single day, they are more profitably done at a single sitting than at four sittings; that whether practice is daily or every other day makes little or no difference in the improvement; and that whether practice is distributed over twenty-four days or accumulated into six days makes little difference provided the long day's work is done at one sitting. Individual differences are very great, certain individuals improving fifteenfold more than others; the most rapid workers tend to be most accurate; as to the form of the work-curve, there is no evidence of initial spurt and very slight evidence of final spurt. In a second investigation it was found that of fifteen college students who practiced typewriting, checking numbers, adding and multiplying, those who possessed initial high ability improved most—excepting in the case of typewriting where the opposite relation was found to hold. In a third investigation, Thorndike attacked the problem of the effect of work and rest upon mental efficiency—the mental function tested being ability to master the meaning of a paragraph. Twelve paragraphs were assigned, ten to be read at a continuous sitting, the other two after a period of rest. It was found that during the continuous sitting the time required for mastering the meaning increases slightly (about five per cent.) as the work is continued; and that it decreases by about fifteen per cent. after a period of rest. The quality of the work remains approximately constant throughout. In a fourth investigation Thorndike assigned to his observers the task of multiplying three-place numbers by two-place numbers; in one case a rest of twenty minutes was introduced after every five multiplications; in another case a rest of ten minutes was introduced; and in a third case the work proceeded continuously. The results show a slight advantage in favor of the ten-minute rest, both in immediate achievement and in subsequent effect.

Batson (2) investigated the process of acquiring skill in motor activities of different degrees of complexity. He found that no plateau appears in the learning-curve in cases where the learning consists in establishing a sensori-motor association of a very simple

sort, and where, therefore, the improvement is the product of a single factor—for instance, in learning to make such accurate estimations of time as would ensure success in striking a specified point upon a moving target. When the acquisition of skill is the product of several coöperating factors—as in learning to toss and catch a number of balls—the learner may adopt a procedure in which he distributes his attention more or less uniformly over the various factors, and he may by this means acquire control over them as a group; in this case again there is no plateau in the learning-curve. But if his procedure consists in isolating the factors and then in successively mastering each factor independently before proceeding to master the others, his learning-curve will be characterized by plateaus. Batson also discusses the influence of various subjective and objective factors, the phenomenon of warming-up, and the permanence of improvement.

Evans (16) studied the effect of distraction upon reaction-time. Reactions to visual, auditory and tactual stimuli were each subjected to visual, auditory and tactual distractions. Records obtained from six reagents show that all modalities of distraction lengthen reaction-time to stimuli of all modalities, the distractive effect being greater when the reaction-stimulus and the distraction-stimulus belong to the same modality. The distraction effect was decreased by practice, but was never wholly overcome. In a second experiment, six reagents practiced reacting to visual and auditory stimuli, both with and without distraction. Before and after the training they were tested in reactions to visual, auditory and tactual stimuli, both with and without distraction. It was found that practice in reacting to a given stimulus with a given distraction improves the reaction to a stimulus of different modality with the same distraction, and to the same stimulus with distraction from another modality. The author refers this improvement to a changed attitude or adjustment on the part of the reagent, which in turn is held to be a product of training in habits of attention. In Mrs. Cowan's experiment (14) lists of words and lists of nonsense-syllables were presented to children who were assigned the task of isolating as many pairs of words or syllables as possible and then of attending to each of these pairs. To this task the children devoted five minutes on each of forty days, the object being to train them in a "habit of attention." Tests of immediate recall of objects and selections of prose were made before and after this period of training. It was found that the practiced group showed

slightly greater improvement in memory for objects and in memory for prose than did the unpracticed group.

Coover's investigation of the transfer of training (13) covers an unusually wide range of mental functions, including sensory discrimination in several modalities, compass of attention, simple and complex reaction involving discriminations and choices of various sorts, the learning and reproducing of various sorts of material, etc. His findings demonstrate the existence of transfer throughout; and while he publishes numerous quantitative statements of the amount of transfer which took place in the several cases, the major portion of his discussion is devoted to an analysis of the factors upon which transfer depends. From the introspections of his observers Coover finds that practice in any activity tends to divest the activity of its adventitious accompaniments; when the activity is of a more complex sort it frequently happens that the reagent adopts a wholly new and more economical procedure in consequence of his training. He tends to acquire a more appropriate distribution of attention over the component processes and over the various possible reactions which he may be called upon to make; he is no longer delayed by non-essential concomitants nor distracted by extraneous stimuli; his attention becomes less variable and more capable of sustained concentration; his several modalities of imagery coöperate more effectively for purposes of recall; a greater number and variety of associative and apperceptive processes come into function, thus insuring a more accurate perception and a more complete and trustworthy reproduction. And since each of these factors may participate in other activities than the specific activity practiced, the effect of the practice may extend beyond the limits of the specific activity. In so far as the practice effect has to do with the material of experience (imagery, representative schemas, and the like) the author employs the term "transference of training"; in so far as the practice effect involves the form of experience (attitude, control of attention, elimination of non-essential concomitants) the author prefers to speak of "spread of training."

II. CONDITIONS WHICH AFFECT MENTAL FUNCTIONING

Chapman and Nolan (10) find that in the task of adding continuously for a period of sixteen minutes (twenty girls, seven working-periods each) much more is accomplished during the first minute than during any subsequent minute—the efficiency during

the first half-minute being twenty-nine per cent. greater than the average efficiency of the last twenty half-minutes of the working-period. Gates (22) reports an investigation of diurnal variations in memory and association. Groups of college students, 165 students in all, were tested at each hour of the day from eight in the morning until five in the afternoon. The tests included visual and auditory memory span, substituting, recognizing, and the remembering of coherent verbal material. It was found that average efficiency in all of the functions tested follows an irregular diurnal course, increasing progressively to a maximum at about ten in the forenoon and dropping to a minimum shortly after noon; the afternoon wave follows a somewhat similar course but the limits of variation are less wide here. Miss Curtis (15) aimed to discover whether the rapid repetition of materials to be learned is more fatiguing than the slow repetition. Her seven observers memorized lists of nonsense-syllables which were presented in auditory fashion, both the time and the number of repetitions necessary for complete memorization being recorded. In a preliminary series of experiments the investigator determined for each observer a rapid rate and a slow rate of presentation which gave equal learning-times. Various means of measuring fatigue were tested, none of which proved wholly satisfactory; it was finally decided to measure the amount of fatigue present by a multiplication test and by the observer's progressive loss of efficiency in memorizing. It turned out that those learners who made much use of visual imagery preferred a slow rate of presentation, while those "who appear to have been greatly aided by auditory-kinæsthetic pre-severation" preferred a rapid rate of presentation. The results of the investigation are not wholly conclusive, due apparently to the presence of pronounced individual variations.

Fernberger (18) investigated the influence of mental and physical work upon judgments of lifted weights. The mental work assigned to his five observers consisted in mastering the content of difficult German prose, the work-period having a duration of thirty minutes; the physical work consisted in exercising the muscles of the right hand and forearm to the point of exhaustion by means of an ergograph. One hundred comparisons of lifted weights were made by each observer before and after the work-period. The mental work seemed to have no influence upon the judgment; but the physical work (which involved the same muscle-groups as were employed in the lifting of the weights) had a pronounced effect in

decreasing the ability to compare lifted weights. Painter (35) raises the question as to whether the onset of mental incapacity in consequence of extreme fatigue is abrupt or gradual. Does the exhausted worker find it possible, say, to multiply three-place numbers when he is no longer able to multiply four-place numbers? The author devoted himself continuously to the task of multiplying four-place numbers until he was no longer able to continue with the task (the duration of this sitting was slightly more than four hours). He found that the ability to do mental multiplication does not tail off gradually but terminates abruptly; at the stage where the ability to multiply four-place numbers is no longer present one finds it impossible to multiply any number by any other number.

Thorndike, McCall and Chapman (42) report an investigation in which forty students were submitted to various tests of mental efficiency (cancelling digits, naming colors, naming opposites, adding and multiplying) under widely different conditions of ventilation—varying between a hot, humid and stagnant condition of air, 86° F. with eight per cent. relative humidity, and an optimum condition, 68° F. with fifty per cent. relative humidity, forty-five cubic feet per person per minute of outside air introduced in the latter case. It was found that the students did as much work, that they did it as well, and that they improved as rapidly in the ill-ventilated room as in the well-ventilated room. Reed (38) assigned various tasks (silent reading, counting, adding, writing, multiplying) to his thirteen observers, and obtained graphic records of the tongue-movements which occurred during the performance of these tasks—the investigator hoping by this means to throw light upon the question as to the functioning of “inner speech.” It was found that in certain observers, movements of the tongue are present throughout, in other observers they are never present, while in a third group they are present in the case of certain tasks but not in the case of other tasks (most frequently present in writing, least frequently in counting). From these and additional experiments where vocal-motor distractions were introduced, the author concludes that “inner speech” does not play an important rôle in mental functioning.

Miss Bronner (6) discusses the influence of attitude and emotion upon intellectual efficiency, and cites cases where indifference, ill-will and deceit on the part of the examinee were influential factors; and where such emotions as anger, fear, shame and the like vitiated the diagnosis. Lodge and Jackson (30) measured

the immediate reproduction (for passages of prose) of 179 college students. The reproductions are evaluated both by a qualitative method, which gives credit for organization and coherence of product, and by a quantitative method, which merely assigns a unit credit for each idea reproduced. The results indicate that the freshmen are the most intelligent group, a finding which the authors believe to be due to greater "natural ability." Students below the age of twenty-five tend to obtain a higher score than students above that age, and the women obtain better scores than the men. The authors conclude that the qualitative method of treating results is to be preferred.

III. HIGHER INTELLECTUAL PROCESSES

Bartlett's investigation of perceiving and imaging (1) consisted in presenting materials (geometrical figures, pictures, ink-blots) and in subsequently asking his observers to report what they had seen or what they had imaged or been reminded of during the presentation. The presence of symmetrical features and novel features facilitates observation and subsequent representation; features at the top of the figure are more readily observed than features at the bottom. Observers tend to label, to criticize, and to evaluate the stimulus during the process of observing; but the most striking phenomenon is the observer's effort to find a meaning. This phenomenon is invariably present. Without it perception is impossible; and the various component processes which constitute a developed act of perceiving are to be regarded as ways in which the effort to find meaning express themselves in the presence of objective stimuli. In a complete act of perceiving may be found processes of imaging (a situation or an object is reinstated from previous experience) and processes of thinking (relations are apprehended). Both of these involve a freeing of the content from its sensory background, and the freeing may proceed so far that the processes take place in the complete absence of sensory stimulation. Imaging tends to retain a characteristic definiteness of content, and to be attended by well-marked feelings; thinking may be equally definite, but the definiteness appears as a characterization of that which is thought about, and feeling is here minimal.

In a study of the evolution of the concept, Gregor's procedure (25) consisted in having children and adults define the meanings of various concrete and abstract terms—chair, brain, crime, lease, cause, contradiction, sympathy, etc. He found that the concept

passes through a number of characteristic developmental stages. The primitive form of defining an object consists merely in stating its purpose or use ("a chair is something for sitting on"); or the defining of a term may consist simply in enumerating the varieties of object to which the term refers. From this primitive origin there gradually evolves a stage in which abstract terms and supra-ordinate concepts are employed, in groping and stumbling fashion at first but gradually more accurately and pertinently. The new concept may develop from a familiar one ("lease is a kind of buying;" "lease is buying something for a year"). At the lower stages of this evolution, accurate and refined differentiation is lacking and hence early connotations are too inclusive; the narrowing down to proper limits is a gradual process in which current forms of speech are among the most influential factors. Miss Fisher (19) investigated the process of abstraction and its product, the general concept. Her experimental material consisted of several series of pen-and-ink drawings of complex colored figures, each figure containing certain general features which were common to all the figures of the series, and certain particular or non-common features; a nonsense-name which designated the series was appended to each figure. These figures were presented in successive fashion, the observer being instructed that he would subsequently be asked to define the group term which designated the series, and to furnish an introspective description of the mental processes and procedures involved throughout. It was found that the process of abstraction is characterized by a succession of imaginal and sensational contents; the essence of the process, however, consists not in the mere presence in consciousness of these contents but in a characteristic behavior or mode of functioning of these contents. And this behavior can best be described in terms of their variations of relative clearness and focality, together with changes in their durative aspects (their rate of emergence, their degree of persistence, and their abrupt or gradual disappearance). Those contents which prove to be general or common obtain an ascendancy over the other contents and prevail in consciousness, while the non-common contents remain unclear and non-focal or sink into oblivion. The visual predominance of the common features was frequently attended by vocal-motor processes of labelling and verbal characterization, by actual or ideated movements of tracing their outlines, and by experiences of imitating and empathy. The mental representation of the concept passed through a series of developmental stages as the

observer's familiarity with the series of figures increased. At the outset, the concept appeared in the form of definite and detailed concrete imagery, usually of a visual or kinæsthetic sort, which was frequently subject to panoramic mutations; but as the experiments progressed these detailed images were supplanted by imagery of a more and more abbreviated and schematic form. Meanwhile, verbal imagery (usually vocal-motor) was assuming a progressively more important rôle, until a stage was reached where the concept appeared almost exclusively in verbal terms. At a later stage, these verbal images in turn became more and more schematic and fragmentary and more and more telescoped, until finally there came a mechanized stage where, after sufficiently frequent recurrence, conscious representation of the content of the concept was wholly lacking—the request to define was here followed immediately by an automatized flow of verbal statement.

Wolters's investigation (44) aimed to discover whether there is any psychological difference between the affirmative judgment and the negative judgment. He assigned various problems to his seven observers, and had them give introspective descriptions of the mental processes involved in solving these problems. The problems were of two sorts: In certain cases an epithet or a predicate was to be supplied by the observer—here in the non-affirmative instances one is concerned with what the author calls “negatives of construction”; in other cases the observer was required to pass judgment upon the correctness of a statement or a picture—the non-affirmative instances are here called “negatives of denial.” An examination of the protocols shows that affirmative judgments and negative judgments do not differ in mental content or in the mental processes by which they are mediated. The two forms of negation, however, (negatives of construction and negatives of denial) are psychologically distinct. The negative of construction differs from the corresponding affirmative only in its verbal expression; logical theory distinguishes between affirmative propositions and negative propositions but there is no psychological difference between the judgments which underlie the two. Whether the resulting proposition is to be affirmative or negative, the course of the judgment is identical in the two cases; it is determined throughout by the thinker's purpose. The negative of construction demands the prior formation of a positive judgment, but the denial of a proposition may be immediate—it may take place without any previous analysis or positive judgment. The denial-negation

is a definite experience which is chiefly emotional in character but it may also contain kinæsthetic and other sensory ingredients. It is essentially a mental disturbance, a complex attitude of caution or even hostility. The corresponding consciousness of agreement or acceptance is less striking and less characteristic. The denial-negation, with its conspicuous components of emotion and kinæsthesi, has probably evolved from a primitive form of reaction; it has elements in common with the animal's combative resistance to interference.

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VISUAL SPACE

BY MABEL C. WILLIAMS

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Only a few contributions to the literature on visual space were added during the past year. Buhler (2), in a very serviceable encyclopædic dictionary in the German language, gives a standard account of the laws and characteristics of visual space perception.

The advantage of side, or uniocular, vision over front, or binocular, vision to the moving animal in gauging the relative distance of objects, is convincingly discussed by Trowbridge (6). When a bird or mammal with lateral vision moves forward, the principal visual axis is perpendicular to its motion, giving the maximum apparent displacement of objects with every forward movement. Distance is judged by the relative displacement: objects near at hand suffer greater displacement than those more distant. This principle should be considered in any theory of orientation implying a sense of direction. Dabney (3) supplements Professor Trowbridge's article by calling attention to the fact that in estimating distance there may occur a "trigonometric operation, in which the distance between the eyes is the base of a triangle, the two lines of vision converging upon the observed object, being the other sides of the triangle."

Watt (7) upon a deductive and somewhat arbitrary foundation, denies the possibility of kinæsthetic components in visual perception of depth. Muscular sensations of convergence and accommodation do not fuse with purely visual sensations into a complex, nor do labyrinthine sensations fuse with the visual. Perception of distance, as in stereoscopy, is due to visual factors solely. Stereoscopic vision is primarily the production of a third direction or dimension of *form*, not space. The primary psychological factor in stereoscopic vision is the binocular disparation of form.

Ritter (4) reports an experimental study of the well-known tendency toward the overestimation of vertical distances. She

connects this with an opposite tendency toward underestimation of horizontal distances. These tendencies, in their coöperative or antagonistic effects, were studied for the eight radii at 45 degree intervals. The author contends that it is possible to conceive of the meridional disparities in the visual field as reducible ultimately to retinal structure on the one hand and to a simple act of visual attention on the other. The macula is wider in its upper than in its lower extent, and four times greater in its transverse than in its vertical diameter. The lower visual field is more critical for life interests and is viewed by the upper, wider, portion of the macula. The panorama of the earth's surface stretches out in its infinite detail in the *horizontal* direction. Readiest attention is given to the fields most fraught with sudden emergencies. This correlation of the illusions with retinal structures and attention is at least suggestive.

Smith (5) studied the apparent alteration of one line when seen in connection with a longer or shorter adjacent line. Contrast was found not to be distinctly and generally operative in modifying the apparent length of a line. It may however be present with other conditions, such as confluence, which sometimes do and at other times do not permit it to appear. Men show more evidence of the influence of contrast, women of confluence.

Arps (1) describes, with full case history, an instance of double inversion in a seven-year-old boy. The case offered opportunity for the study of the reconstruction of space perception through a new association of visual and tactual elements, where the new sensory elements were the direct opposite of the original association.

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SPECIAL REVIEWS

Three Contributions to the Theory of Sex. S. FREUD. (Trans. by A. A. Brill.) New York: Nerv. & Ment. Dis. Pub. Co., 1916.

Taken as the product of the pen of one whose profession gives unusual opportunity for collecting data in the field of the human sexual life, the *Three Contributions to the Theory of Sex* may be recommended to the reader who desires to dig out the psychological and behavioristic facts upon which Freud bases his hypothesis of sex. When we strip off the much-criticized terminology—the libido, the unconscious, the censor, the pleasure and reality principles, the complex—we have left Freud's statement of certain facts concerning typical developments of sexuality from infancy to maturity.

Adult sexuality is the product of the concurrence of many "partial" tendencies, all of which have a pre-pubertal history. These infantile tendencies possess the following characteristics: (1) They are relatively undifferentiated in the two sexes; (2) they are not integrated into a complex whole; (3) they are not necessarily nor, chiefly, concerned with the genital mechanisms; (4) they are primarily auto-erotic; (5) they tend toward an "incestuous" fixation upon the parent. At puberty there occur typical modifications of behavior which involve normally the reorganization and the inhibition, in whole or in part, of the infantile tendencies. These inhibitions Freud calls "repressions" to indicate the fact that the infantile tendencies persist, as neural dispositions perhaps, and may become active once more in post-pubertal behavior and thus upset the normal course of development. The factors that determine the repressions are various: chemical, neural, social. The child leaves behind its undifferentiated bisexuality and becomes a man or a woman. The one or the other set of component tendencies is repressed. This is basically conditioned, Freud believes, by a differentiation in the chemical nature of the secretions of the genital glands. Again, the several relatively independent auto-erotic activities of childhood are either repressed or modified, and reorganized into a complex system that is subordinated to the functioning of the genital mechanism proper. This is essentially a function of the reorganization of the neural mechanisms of infantile

behavior into a chain of reflexes that has its terminus in the sexual act. The patterning of this system of neural arcs, as of the arcs of the infantile tendencies, is conditioned in part by hereditary factors; but Freud would wish to emphasize, on account of his interest in therapy, the large *controllable* environmental factor. And finally, the exclusive fixation of the child's affection upon the infantile love-object, usually the parent, is repressed by the erection of the incest-barrier and replaced by the striving after the mate. This third type of repression is primarily a matter of social and institutional control. Thus the connotation of the term *repression* becomes very broad indeed, including as it does organizing and inhibiting processes of divers kinds. Yet broad though its meaning be, there is one connotation popularly assigned to the Freudian term which it certainly does not have for Freud. Repressions are *essential* for normal development, and they are not, as is popularly supposed, necessarily abnormal. Abnormalities arise when certain aspects of infantile tendencies are imperfectly repressed or inhibited. Such tendencies may crop out in post-pubertal behavior and find abortive expression in neuroses, perversions, inversions, fetichisms, etc. Or, on the other hand, from them may also develop all the cherished products of civilization: the inventions and the arts, myth, religion and science. When this is their fate, they are called "sublimations." Thus imperfectly repressed infantile tendencies may develop on the one hand into pathological behavior, on the other into human culture.

Limitations of space preclude adequate criticism of the volume. Quite apart from Freud's much criticized theoretical postulates, it yet remains true that his exposition of the facts of human sex behavior has succeeded in attracting the attention of psychology and in stimulating criticism in a degree that is unequalled by any other writer on the subject. It is unfortunate, however, that he has couched the greater part of his presentation in terms of male behavior, which is treated as the type. Such a procedure not only reacts upon his theoretical postulates and makes them less usable, but it also forces the peculiarly female functions and attitudes out of focus and ignores important differences. It becomes increasingly clear that if further progress is to be made, it will be necessary to abandon the problem as it now stands: the inquiry into the nature of the mechanisms that yield pleasure to the organism, and to envisage it as the problem of reproductive behavior. The orgasm, yielding the "end-pleasure," may constitute the physiological

terminus of normal reproductive behavior in the male, but in the female the physiological cycle of reproduction is normally completed only at parturition—a fundamental difference which no adequate account may ignore.

The Significance of Psychoanalysis for the Mental Sciences. O. RANK & H. SACHS. (Trans. by C. R. Payne.) New York: Nerv. & Ment. Dis. Pub. Co., 1916.

In a monograph entitled *The Significance of Psychoanalysis for the Mental Sciences* Otto Rank and Hanns Sachs, of Vienna, attempt to apply concretely, in the fields of social and folk psychology, the Freudian conception that the processes and products of civilization are essentially the modified or sublimated expression of infantile sexual tendencies that somehow escaped repression. Three points are emphasized throughout. First, that sex rather than food-activity is the source of civilization because "to the hunger instinct which is served only by immediate real gratification, the world of phantasy stands immensely farther away than to the sexual instinct." Sexual tension, finding no direct expression by reason of social taboos, is released in symbolic acts. Thus the making of fire and the ploughing of soil arose as modifications of sex behavior, and it is only later that they become integrated into the civilized food-process. Secondly, great emphasis is placed upon the "incest-barrier" as a factor in civilization. Myth, religion, cult and ritual are not the organization of the ideals of the group, but mechanisms for allowing a "harmless" expression of forbidden incestuous strivings by way of imagination and symbolic acts. It is a strange picture of human culture that is presented to the reader—a picture in which man's spiritual treasure is portrayed as being essentially the product of the creation of barriers between the son and the mother! And finally, the antithesis between the "real" and the "mental" recurs throughout. "Reality" is overt response to physical stimulus, and in the degree in which this sort of behavior is repressed we have increasing "unreality" which is identified with the "mental." Thus we are told that, in the philosopher, there is "a much farther forced diversion from sexual into mental, transcendental, unreal" than in the artist. The rise of the ancient antithesis between thought and reality in this psychoanalytic setting becomes significant on account of the implied correlation between the inhibition of overt behavior and the occurrence of conscious processes.

Mechanisms of Character Formation: An Introduction to Psychoanalysis. W. A. WHITE. New York: Macmillan, 1916.

White's volume on *Mechanisms of Character Formation* not only presents the psychoanalytic point of view to the lay reader, but also introduces him to much pathological material that hitherto was largely inaccessible to him. Through the pages of this book the "libido" of Freud and Jung, the "élan vital" of Bergson and the "will to power" of Nietzsche seem veritably to flow as a living stream. There is not only the libido of hunger and of sex, but every organ of the body has its own special libido. Thus we learn that defective vision is "a defective use of eye libido." The "unreality" of the psychical does not trouble White. It is interesting to note that where the European follower of Freud emphasizes the point that the formation of the symbol is indicative of a "renunciation of reality," the American disciple sees it as a "carrier of energy" exquisitely fitted for increasing man's control over his environment, for it is "the vehicle for the carrying of energy from person to person, from the past into the present and into the future." "The energy bound up and concentrated in the symbol is hardly capable of measurement by the crude methods of calorimetry." "The symbol 'patriotism' may release the energy of a whole nation just as in the individual the symbol 'contest' may mobilize the liver sugar and discharge it into the blood." The book abounds in interesting hypotheses tentatively entertained. By way of Fabre's spiders that lived for seven months apparently without taking food, he comes upon the hypothesis that the animal organism may possibly utilize solar energy directly, without fixation by chlorophyl. He then advances the curious suggestion that "the hundreds of thousands of receptors at the surface of the body" constitute "a real and material source of energy which has been, largely at least, overlooked." Here the critical reader must necessarily be troubled by the vagueness of the conception of energy with which psychoanalysis operates. Taken all in all, the reader cannot come away without a feeling of the actuality of the cosmic urge at the root of life. And while he has a glimpse of the awful abysses toward which this cosmic urge may drive the human spirit, he comes away also with a new faith in the possibility of intelligent self-direction and educational guidance. And herein lies the value of the book.

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DISCUSSION

A LIBRARY CLASSIFICATION FOR BOOKS ON
PSYCHOLOGY

Any library classification of scientific books is necessarily arbitrary. Usually the schemes are constructed from a logical point of view rather than from a utilitarian one, hence there is a certain antagonism between the needs of the classifier and of the user of the books. When the complaint is from one party only, it is difficult to apply a remedy, but when objection comes from both the classifier and the user, the application of a remedy is possible. Psychology in its rapid development has outgrown any scheme of classification of its literature suitable ten years ago. The Dewey Decimal System, rather commonly used, has become quite inadequate for classification purposes. Many of the titles find no place in the scheme and the classifier finds it impossible to do more than guess where some of the numerous books should be placed in this system; consequently the work of the classifier is open to the criticism of the user. Many troublesome errors of classification can easily be found, due entirely to the inadequate system.

From the user's point of view all books on psychology should be found together, and those on various phases of the subject should be grouped into units. According to the Dewey system, psychology books are classified under the general numbers 130-139 and 150-159, and these two groups are not neighbors on the shelves. Books such as those on applied psychology, physiological psychology, etc., are not provided for in the classification, and, although purchased by the psychological department, are to be found with books of the other sciences. Thus Dodge's *Psychological Effects of Alcohol*, has in one case been put in the chemical library, while applied psychology books are to be found in a half dozen different places.

Any new scheme must satisfy both the logical demand of the classifier and the practical one of the psychologist. The present scheme is a compromise between the Dewey decimal system and the plan on which the Psychological Index is constructed. It has been worked out by the writer in coöperation with the members of the department of psychology at Columbia University and with members of the library staff. It has been adopted by the Columbia University library, and has been in use for twelve months. All

new books purchased by the department are classified according to it, and the old books are being changed.

No scheme can make an intelligent classifier unnecessary, but this one simplifies and standardizes the work of the classifier, because he can refer to the Psychological Index for help in locating old books and thus learn how to place new ones. And often new ones are purchased after they are listed in the index, and can be located according to it. It offers chance for growth and subdivision in any department of the science, by the use of additional decimals. It brings all of the books recommended by the department together and provides place for such groups as physiological, applied, social and abnormal psychology.

One further advantage of the plan is that where there are department libraries subsidiary to the general library, books may be transferred from the latter to the former, and their numbers will provide proper grouping of the books for the various courses in psychology.

The plan of classification follows. The numbers in parenthesis represent the number of the group according to the Dewey System. All groups not marked with numbers in parenthesis are new.

- .150. PSYCHOLOGY—General textbooks and systematic treatises.
(150) .1
- .2
- .3 Dictionaries and Encyclopedias.
- .4 Essays.
- .5 Periodicals.
- .6 Societies, Transactions and Reports, etc.
- .7 Methods.
 - .01 Study and Teaching.
 - .02 General Apparatus, Experimental and Statistical Technique.
 - .03 Tests.
- .8 Collected Works.
- .9 History and Biography.
 - .08 Collective Biography.
 - .09 Individual Biography.
- 151. PHYSIOLOGICAL PSYCHOLOGY.
- (611.8) .1 Anatomy of Nervous System—Embryology, Histology, etc.

- (612.8) .2 Physiology—Cerebral Localization, Nerve Conduction, etc.

152. SENSATION AND PERCEPTION.

- (152) .1 Sensation and Sense Organs—General.
 .2 Vision and the Eye.
 .3 Hearing and the Ear.
 .4 Lower Senses and their Organs—Organic, cutaneous, muscle, tendon, joint, taste, smell, static, etc.
 .5 Perception—General.
 .6 Space Perception and Illusions—Stereoscopic Vision.
 .7 Perception of Time, Motion and Rhythm.
 .8 Psychophysics—Weber's and Fechner's Law, etc.

153. ATTENTION, MEMORY AND THOUGHT.

- (153) .1 Attention and Interest.
 (154) .2 Memory and Imagination—Association, Retention, Reproduction, Recall, Recognition, Imagery, etc.
 (156) .3 Thought—Meaning and Understanding.
 .4 Comparison, Abstraction, and Ideation.
 .5 Judgment and Belief—Reasoning.
 .6 Disorders of Attention, Memory and Thought.

154. FEELING AND EMOTION—Affection, Passion, Sentiment, Mood.

- (157) Temperament, Emotional Expression.

155. MOTOR PHENOMENA AND VOLITION—General.

- (158) .1 Reflexes and Automatic Functions.
 (159) .2 Instinct and Impulse.
 .3 Voluntary Movements—Dynamogenesis, Inhibition, Adjustment.
 .4 Work—Motor learning, Habit Formation, Practice, Transfer.
 .5 Fatigue—Mental and Physical.
 .6 Reaction Experiments.

156. SPECIAL MENTAL STATES.

- (133) .1 Sleep, Dreams, Narcosis.
 (134) .2 Hypnosis and Suggestion.
 (135) .3 Subconscious.
 .4 Psychical Research—Clairvoyance, Telepathy, Occultism, Spiritism, Magic.

157. ABNORMAL AND PATHOLOGICAL PSYCHOLOGY—(Psychiatry and other General Textbooks.)
- (131,
132) .1 Mental Defect—Idiocy, Imbecility, Feeble-mindedness.
 .2 Insanity—Senile Dementia, Dementia Præcox, Manic-Depressive Insanity, General Paralysis.
 .3 Nervous Diseases—General (Aphasia, Apraxia, Epilepsy, Chorea).
 .4 Psycho-neuroses—Hysteria, Double Personality, Neurasthenia, Psychasthenia, Fear Neuroses, Fixed Ideas.
 .5 Mental Healing—Psycho-analysis, Psycho-therapeutics, Christian Science.
158. APPLIED PSYCHOLOGY—General.
 .1 Educational—Textbooks, Problems of Education.
 .2 Business—Invention, Advertising, Selling, etc.
 .3 Industrial.
 .4 Legal—Responsibility, Testimony, etc.
- (131,
133,
138,
139) .5 Vocational Guidance and Selection—Physiognomy, Phrenology, Astrology, Palmistry, etc.
159. INDIVIDUAL, SOCIAL AND COMPARATIVE PSYCHOLOGY—General.
- (136,
137) .1 Individual Psychology—Self and Individual Differences, Age, Sex, Adolescence, etc.
 .2 Heredity and Evolution.
 .3 Comparative Psychology—Animal Psychology.
 .4 Social and Race Psychology.
 .5 Psychology of Language.
 .6 Psychology of Religion.
 .7 Psychology of Ethics and Values.
 .8 Psychology of Art—Æsthetics.

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BOOKS RECEIVED

- WENLEY, R. M. *The Life and Works of George Sylvester Morris*. New York: Macmillan, 1917. Pp. xv + 332.
- PARKER, D. W. *The Self and Nature*. Cambridge: Harvard University Press, 1917. Pp. x + 316.
- [ANON.] *Playthings*. Bureau of Educ. Experiments, Bull. No. 1, New York, N. Y. Pp. 16. 10 cents.

- GARRETT, L. B. *Study of Animal Families in Schools*. Bureau of Educ. Experiments, Bull. No. 2. New York, N. Y. Pp. 19. 10 cents.
- [ANON.] *Experimental Schools (The Play School)*. Bureau of Educ. Experiments, Bull. No. 3. New York, N. Y. Pp. 22.
- [ANON.] *Experimental Schools (The Children's School, etc.)*. Bureau of Educ. Experiments, Bull. No. 4. New York, N. Y. Pp. 31. 10 cents.
- [ANON.] *Experimental Schools (The Stony Ford School, etc.)*. Bureau of Educ. Experiments, Bull. No. 5. New York, N. Y. Pp. 26. 10 cents.
- BOARDMAN, H. *Psychological Tests, a Bibliography*. Bureau of Educ. Experiments, Bull. No. 6. New York, N. Y. Pp. 75. 25 cents.
- GERRISH, F. H. *Sex Hygiene. A Talk to College Boys*. Boston: Badger, 1917. Pp. 51. 60 cents.
- WOOD, C. A. *The Fundus Oculi of Birds. A Study in Comparative Anatomy and Physiology*. Chicago: Lakeside Press, 1917. Pp. 181. \$15.00.
- LOWIE, R. H. *Culture and Ethnology*. New York: D. C. McMurtree, 1917. Pp. 189.
- PARSONS, E. C. *Social Rule. A Study of the Will to Power*. New York: Putnams, 1917. Pp. 185. \$1.00.
- BERNHEIM, H. *Automatisme et suggestion*. Paris: Alcan, 1917. Pp. xv + 168. 2fr. 50.
- KITCH, E. M. *The Origin of Subjectivity in Hindu Thought*. Chicago: Univ. of Chicago, 1917. Pp. 82. 50 cents.
- LAY, W. *Man's Unconscious Conflict*. New York: Dodd, Mead, 1917. Pp. vi + 318. \$1.50.
- WASHBURN, M. F. *The Animal Mind. A Text-book of Comparative Psychology*. New York: Macmillan, 1917. (Second Edition.) Pp. xii + 386. \$1.90.
- HOLLINGWORTH, A. L. & POFFENBERGER, A. T., JR. *Applied Psychology*. Pp. xiii + 337. \$2.25.

NOTES AND NEWS

THE August number of the BULLETIN was prepared under the editorial direction of Professor W. S. Hunter, of the University of Kansas.

MISS FRANCES LOWELL, assistant in psychology in the University of Minnesota, has been appointed research assistant in the department of research of the State School for Feeble-Minded at Faribault, Minnesota.

DR. J. F. DASHIELL has been appointed instructor in psychology in Oberlin College.

DR. H. R. CROSLAND has been appointed instructor in psychology in the University of Arkansas.

PROFESSOR ROBERT M. YERKES, chairman of the department of psychology of the University of Minnesota, who has recently accepted a commission as Major in the Sanitary Corps, has been granted leave of absence for so long as the government requires his services. Associate Professor Herbert Woodrow has been appointed to act as chairman during Major Yerkes' absence.

A NEW journal for neurology and allied subjects, *Schweizer Archiv für Neurologie und Psychiatrie*, is to be published at irregular intervals four times a year under the editorial direction of Professor C. v. Monakow and an editorial board of Swiss neurologists and psychiatrists.

THE following psychologists have been appointed, or requested to serve, in the Signal Office Reserve Corps, Aviation Section, non-flying: Major, J. B. Watson; Captains, M. Bentley, F. S. Breed, S. S. Colvin, G. V. Hamilton, V. A. C. Henmon, F. L. Wells.

THE following named psychologists have been recommended for commissions in the Sanitary Corps to serve as Psychological Examiners in National Army cantonments: Major, Robert M. Yerkes, Surgeon General's Office, in charge of psychological work; Lieutenants Clarence S. Yoakum, Marion R. Trabue, Jos. W. Hayes and Wm. S. Foster to serve as Chief Psychological Examiners; Lieutenants Geo. O. Ferguson, Jr., Walter S. Hunter, Edw. S. Jones, Karl T. Waugh, Heber B. Cummings, Edgar A. Doll, John T. Metcalf, Herschel T. Manuel, Carl C. Brigham, John E. Anderson, Horace B. English and Harold A. Richmond to serve as Psychological Examiners.

In addition to the above commissioned Examiners, the following have been given civil appointments for Psychological Examining: Doctors Leo J. Brueckner, Donald G. Paterson, A. S. Edwards, Rudolph Pintner, Benj. F. Pittenger, Ben. D. Wood, John W. Bridges, J. Crosby Chapman, John K. Norton, Edward C. Rowe, J. David Houser, C. P. Stone, Thos. H. Haines, Norbert J. Melville,

H. P. Shumway, Chas. H. Toll, Thos. M. Stokes, C. C. Stech, John J. B. Morgan, Raymond H. Wheeler, Harold C. Bingham, Carl R. Brown, Chester E. Kellogg, and Ralph S. Roberts.

Doctors Arthur S. Otis and Truman L. Kelley have been appointed members of the psychological staff in the Office of the Surgeon General with special responsibility for statistical work and the revision of methods of examining.

THE Committee on Classification of Personnel in the Army has been appointed by Secretary Baker and placed under the jurisdiction of the Adjutant General. This Committee has organized and is directing the occupational census and classification of the men in the National Army; has installed in the second series of Reserve Officers' Training Camps the system of personal records and ratings by which the men will be selected for commission; has coöperated with the Signal Corps, the Quartermaster Corps and other arms of the service in preparing application forms, qualification records, and other aids in sifting and assigning personnel; and has stimulated research on qualifications desired in aviators and on tests for selecting recruits to be trained for special duties. On the scientific staff of the Committee are the following psychologists: Walter Dill Scott, Director; E. L. Thorndike, Chairman; W. V. Bingham, Executive Secretary; James R. Angell, R. Dodge, R. B. Perry, J. F. Shepard, E. K. Strong, Jr., J. B. Watson, R. M. Yerkes, L. M. Terman. Dr. Terman gives up his work with the Committee to return to Stanford University October 1. Dean Angell has leave of absence from the University of Chicago and will be in Washington until January 1. The other members of the Committee are all giving part or full time to the work in Washington. They have the coöperation of R. C. Clothier, H. L. Gardner and sixteen other employment managers, of several army officers, and of a few volunteer assistants.

PROFESSOR F. A. C. PERRIN, of the University of Pittsburgh, has resigned to accept the position of adjunct professor of psychology at the University of Texas. Mr. J. U. Yarbrough has been appointed instructor in psychology at the same institution.

THE
PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

ADOLESCENCE

BY BIRD T. BALDWIN

The State University of Iowa

In a quasi-scientific manner Starr (34) presents in a suggestive little volume on adolescence chapters on growth, muscular development, physical education, diseases of adolescents, criminal tendencies, and sex enlightenment. No other books falling within the direct connotation of the psychology of adolescence have been issued since our last *Sammelbericht* (2) but within the range of special studies definite work has been accomplished.

Juvenile Delinquency.—A London journal of July 3, 1917, calls attention to the serious increase in juvenile crime due to war conditions which is being brought to the notice of the Home Secretary by various societies interested in child welfare. It is stated that three remand homes are full of culprits sent from various London courts, including the Tower Bridge gang of van robbers, whose ages scarcely reached double figures, and the leader of the Clutching Hand band, who is barely twelve years old. These two bands of young ruffians stole parcels from vans and turned them into coin for the purchase of pistols, knives, torches and swords. Similar authentic accounts of the increase of juvenile delinquency in Canada have been given. Haines (22) calls attention to the increase of crime in Ohio and True (37), Abbot and Breckenridge (1) have published excellent books on lawlessness and truancy. Of particular note in this connection are Goddard's (20) *Criminal Imbecile*, Gruenberg's (21) *Sons and Daughters* and Weidensall's (38) *Mentality of the Criminal Woman*.

The delinquent problem is involved with that of mental de-

ficiency. Williams (39), who examined 150 boys by the Stanford Revision of the Binet-Simon Measuring Scale of Intelligence finds: Definitely feeble-minded 28 per cent., borderline 25 per cent., "dull normal" 22 per cent., normal or above 25 per cent. He finds that among this group of delinquents there has been much truancy; that many have been expelled or otherwise dismissed from school before a reasonable amount of school training had been received; that this dismissal from school has been most frequent in towns where no provision has been made for special instruction for exceptional or unruly children.

A psychological analysis of the mental traits of juvenile delinquents and a constructive, critical evaluation of mental tests furnish the purpose of Baldwin's (3) investigation of 1,000 delinquents. The scope includes a statistical and a graphic representation of the fifty-nine tests on a thousand individuals, supplemented by the subjects' physical condition, hereditary orientation, social deviation and school progress. Social deviation of the nature of the delinquency is correlated with and partially dependent on mental deficiency, since 43 per cent. of the white girls are retarded 4 years or more; 47 per cent. of the colored girls; 22.2 per cent. of the one group of white boys; and 43.82 per cent. of the other group.

In order to test the validity of the different revisions and to compare their results, 100 girls were tested by Fernald (15) with each of the four revisions: Binet, 1911; the Huey Revision; the tentative Stanford Revision of 1914; and the final Stanford Revision of 1916, with the following results: moron 24 per cent.; borderline 12 per cent.; normal and low normal 51 per cent.; unusual ability 13 per cent.

Bronner (8) analyzes the effect of *Adolescent Instability on Conduct* and Ordahl (31) finds 25 per cent. of the minor dependents, 45 per cent. of the minor delinquents are feeble-minded: in both the minor dependent and the minor delinquent groups 60 per cent. of the parents, so far as data were available, are either alcoholic, immoral, feeble-minded or insane: the chief offenses of the boys are truancy and offenses against property, of the girls immorality; boys below 14 years of age apparently become delinquent because of a lack of proper home control, boys above this age because they have not the necessary intelligence to make needed adjustments.

Among other important experimental investigations in Juvenile Delinquency may be mentioned those by Beanblossom (5), Haines (23), Healy and Bronner (26), Hickman (27), Sterns (35, 36).

Baldwin (4) working with a retarded adolescent boy of strong moral traits believes that any scale of intelligence that measures a deficient child in terms of the normal child overlooks certain characteristic traits, emotions, instincts, and certain stages and nodes of mental maturation, and possibly a certain acuity of sensory-motor reactions which should be taken into consideration. It is the purpose of this paper to initiate further study into the types of mental retardation, with the accompanying mental defects and bias, from the psycho-etiological standpoint, in order that more systematic analyses may be made and casual relations established.

Important psycho-sociological studies in heredity of special families in which delinquency has been a potent factor for consideration are those of *The Feebly Inhibited* by Davenport (13), *Sam Sixty* by Kostir (29), the *Dack Family* by Finlayson (16), the *Jukes* in 1915 by Estabrook (14), and Yerkes (42) *Will-Being*.

Moral Education.—Healy (25) gives a good study of types of deviation from accepted standards of honesty among juvenile delinquents and analyzes the fundamental motives leading to dishonesty under the captions: home conditions and parental behavior, companionship, discipline, amusement and adventure, mental, physical and social habits, and dishonesty as an outgrowth of various forms of abnormal mentality.

Giles (19) finds the problem of the first period of adolescence is one of trial and discovery; the essential problem of the second period is one of control of the newly discovered self and this problem often lasts until well on into mature life, and in some cases is not solved at all. Schematically, then, the progress in the development of the individual during adolescence is as follows: There is a lull physically in the years immediately preceding adolescence, with fairly good conduct; but with the increase in strength and the impulsion of new-felt powers—mental and physical—the growth of sex, etc., there comes a general revolt against restraint. In this period so much of the petty stealing and truancy occur, and here is the critical period which lasts until moral values are established. Then there is a division into two groups—the class which solves the problem of control and organizes life on social lines, and another class, the members of which for reasons of environment or heredity follow the path of desire, delinquency and crime. We may say summarily that the problem of education in the adolescent period is to provide an environment wherein the individual can find sufficient freedom to try out his social impulses, yet an environment so

organized that he shall not take a distinctly unsocial or immoral combination of them.

From the standpoint of adolescent religion Coe (11) gives a number of interesting studies on conversion, Huth (18) discusses religious concepts among adolescents and Hartshorne (24) holds that there is a tendency during early adolescence for worship, and to move away from the more personal or individualistic topics toward topics of wide social bearing. Forbush (17) orientates child training from a moral point of view, while Shepherd (33) discusses the religious aspects and Whitney (40) carried on experimental investigations in morals.

Vocational Guidance.—Bloomfield and Suzallo (7) outline what is being done in some cities in Great Britain, Germany and the United States by way of vocational guidance for adolescents and Gaylor (18) finds that a large percentage of adolescent boys and girls do not definitely decide their life work until their first year of high school; a large percentage vacillate, influenced by a teacher's personality; and there is a greater school life expectancy for those who remain constant in choice than for those who change.

Particular interest in England in regard to the vocational life of adolescent girls is shown by the writings of Charlesworth (10), Courtney (12), Oldham (30). For an extensive annotated bibliography on the recent tendencies in military training here and abroad for adolescents, reference may be made to the monograph by Burgess, Cummings and Tomlinson (9).

Mental Tests.—The reviews of mental tests will be found in other numbers of the BULLETIN, but of particular interest in this connection is the work of Woolley (41) which is based on the idea that while no one test yields a satisfactory measure of ability, a group of tests does give a significant result. These scales, combining mental and physical measurements, are for fourteen- and fifteen-year-old native-born white children and are based on the testing of 750 fourteen-year-old children who were dropping out of school to go to work, and on 680 of the same children at fifteen years of age, after they had been at work for one year. The same tests have been given to a group remaining in school but the scales for them are not ready for publication. In most of the tests the girls are a little superior to the boys, excepting in tests for mechanical ingenuity; the scale has given a new method of measuring the higher grades of mental defect. Of similar interest are the tests of Porteus (32). The application of special tests to the later adolescent

period has received special attention and they have been summarized by Bingham (6).

As an evidence of the popular interest in psycho-analysis there is an unfortunate tendency for laymen to advocate the use of Freud's methods by untrained teachers in public schools.

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EDUCATIONAL PSYCHOLOGY

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Texts, Treatises, Monographs and Manuals.—The past two years have been prolific in the production of texts and monographs of psycho-educational import, though no comprehensive and fundamental treatise in educational psychology has appeared since our last *Literaturebericht* of 1915 (8). These contributions center around the general principles in Educational Psychology, Formal Discipline, How to Study, and Experimental Exercises and Investigations.

With a strong psychological bias due to the deep insight of the late Dr. Norsworthy, the new text by Strayer and Norsworthy (85) presents in fifteen chapters the fundamentals of the art of teaching. The method of the teacher is determined by the special development of each pupil and the aim is determined by society. Mental development is treated from the standpoints of original nature, attention, habit, memory, imagination, thinking processes, appreciation, play, individual differences, child development, and transfer of training, with a consideration of classroom exercises, how to study, and the measurement of the achievement of pupils.

The first part of Dewey's (26) significant book includes chapters dealing with education from the social, the biological, and the disciplinary points of view. There is a detailed consideration of the doctrine of interest and an analysis of thinking in its relation to experience and to the method of education. The second part of the book deals with the significance of the various subjects of the curriculum, the values of different types of education and theories of knowledge and morals. A good book which might well furnish the background for an introduction to educational psychology is that of Conklin's (19) new work in anthropology.

The most serviceable book that has appeared on the measurement of intelligence is that of Terman (87) which gives in detail the Stanford Revision of the Binet Scale. Part I has seven chapters: I, The uses of intelligence tests; II, Sources of error in judging intelligence; III, Description of the Binet-Simon method; IV, Analysis of one thousand intelligence quotients; VI, The significance of various intelligence quotients; and VII, Reliability of the Binet-Simon method. The second half of the book is devoted to a guide

for the use of the author's revised scale with examples and supplementary material.

Johnston (47) has issued a new edition of his *Modern High School* in which slight changes have been made by placing additional emphasis upon democratic ideals and Claparède has published a 1916 edition of *Psychologie de l'Enfant et Pedagogie experimentale*.

Among the important contributions from the experimental point of view to the problem of *Formal Discipline* are those of Rugg (68), Coover (20), Hewins (42) and Woodrow (96). The first author presents in condensed, tabulated form the results of the important studies on the subject up to the present time and gives an account of an elaborate experiment undertaken to determine the spread of improvement from a school subject to types of activity of a markedly different nature. He states that in the past sixteen years thirty experimental studies within this field have been published, and six of these have to do with school activities. Rugg's results show that there was a greater gain on the part of the trained group than of the untrained group, and that the gainers of the trained group gained in a distinctly larger proportion of the tests than did those of the untrained group.

An excellent monograph by Coover gives an orientation in the subject, recounting briefly the most important results of previous experiments. Part II, comprising over two hundred pages, reports the results of experiments with such exercises as marking out words, estimating weights, visual and auditory discrimination, and two extended series of tests on attention and reproduction. The author concludes that even the simplest exercises involving attention and reproduction are extremely complex processes from the point of view of the mental activities involved.

The first 48 pages of Hewin's monograph are devoted to a summary of psychological and pedagogical experiments on the subject of formal discipline, while the latter part gives an account of the author's own experiments with three classes of freshman pupils in a New York City high school on "the training of observation" in biology work. The results apparently gave evidence of improvement in one type of observation carried over to other kinds. For a semi-popular discussion of this problem Professor Shorey's articles in the contemporary numbers of the *Atlantic Monthly* may be cited.

Woodrow carried on experiments to determine how feeble-minded children compare with normal children of the same mental age as regards practice effects and the transfer of training. He

found that the degree of intelligence (mental age) is a condition of the rate of learning, but the rate of learning does not affect the rate of growth in intelligence.

From a pedagogical rather than from a scientific psychological point of view Hall-Quest (40) states that the aim of his book on supervised study is to formulate a tentative conception of supervised study and to collect data on supervised study that have appeared in several periodicals within the last five years and that may not be accessible to the majority of teachers. Sandwich (72) emphasizes the value of self-confidence, of a regular schedule for study, of the value of recall in learning, the use of the synopsis, the cultivation of rapid reading, and the effects of imaginary competition; Part II takes up the study of the values of the different school subjects. In a quasi-popular educational treatise Dearborn (25) discusses how to learn easily, including economy in study, observation and the taking of notes, educative imagination, books and their educative use, "Is your 'Thinker' in order?", examination preparedness, and originality.

In a tentative study which needs further differentiation and corroboration Thorndike, McCall and Chapman (90) attempt to determine the relation of ventilation to mental work.

In contrast with the earlier work in educational psychology as conducted by professional psychologists with a view to making an application of general psychological principles to education, the tendency is toward empirical studies; Freeman (32) in his book in experimental education "attacks directly the practical problems and attempts to throw light upon them by an analysis of the psychological principles which are involved in them." A brief introductory chapter gives an account of the significance of experimentation and general instructions as to methods of treatment of data. The next section of the book deals with experiments bearing directly on school subjects—writing, reading and number work. Finally, there appears a series of tests of the visual and auditory senses and of the higher mental functions. The descriptions of methods of treating results, including graphic representation and mathematical treatment and tabulation of data, are of especial value.

The Texas *Laboratory Manual in Experiments in Educational Practice* (43) aims to furnish elementary students with an introduction to experimental procedures in education and comprises experiments in the control of association, memory, imagination, the perceptual process, the higher thought processes, the control of

attention, motor learning, suggestion, individual differences, and mental measurements.

A syllabus by McManis (54) of 15 chapters with 254 appended references is adapted for observational and experimental work in individual psychology with special reference to growth, home conditions, instincts, school life, mental traits, learning processes, language, drawing, motor coördination, moral ideas, and individual differences. The references are well selected, the outline of topics suggestive, and the contents serviceable for introductory normal-school classes. Meredith's (55) little book gives a review of the services which psychology is rendering to the study and practice of education. Pyle (66) has issued a booklet which gives scores for the simple physical and mental tests such as height, lung capacity, strength of grip, association, rote and logical memory, substitution, and other tests. Among the psycho-educational investigations appearing in the Fifteenth Year Book of the Society for the Study of Education (57) bearing on the subject of educational psychology may be noted those of Baldwin, Ballou, Buckingham, Courtis, Judd, Oberholtzer, Sears, Starch, Trabue, and Whipple. The Sixteenth Year Book (58) contains the second report of the committee on minimum essentials in elementary school subjects.

Studies in Motor Coördination.—Various aspects of the analysis of motor coördination in speech have been tried by Dunlap (28), Swift (86), and Blanton (11); rhythm by Crawford and Fogg (22); left-handedness by Jones (48); motor learning by Pechstein (61); and the use of the form board by Wallin (93). Cellérier (15) briefly analyzes habit-formation.

The effects of physical fatigue on mental efficiency have been studied experimentally by Dockeray (27), Poffenberger and Tallman (65) and Gates (34). For the numerous studies in Attention, Memory, Learning, etc., and the extensive developments and use of Mental Tests references will be found in other numbers of the BULLETIN.

Educational Institutes and Agencies.—The Leipzig Institute (1) for experimental education and psychology numbered in 1914 one honorary member (Wilhelm Wundt), 168 active and 87 passive members. In spite of the fact that the outbreak of the war called away many of its members, it was decided to continue the work of the Institute as far as possible. The München Institute of Educational Psychology (2) began in 1914 and concerned itself primarily with questions of early childhood and the kindergarten education,

powers of expression in the child, and the sociological basis of education, but was forced to desist from several of its regular meetings owing to the outbreak of the war. An institute for the study of nervous children was established at Budapest. Mr. Burt, psychologist to the London County Council, indicates ways in which the psychologist and pedagogical research student can most helpfully coöperate during war time.

One of the most significant movements in America has been the establishment of the Iowa Child Welfare Research Station for the scientific investigation of the development of normal children. An annual appropriation of \$25,000 has been granted for the work.

Among the comprehensive applications of recent experimental studies in educational psychology are those of the Cleveland "Survey" under Ayres (6) and of the Salt Lake City measurements by Cubberley (24). Flexner's (30) *Modern School* will attempt to reveal many of the traditional absurdities of the present-day education, and will "try out" a curriculum constructed from the four domains of science, industry, æsthetics and civics. The school is to be affiliated with Teachers College, Columbia University.

The new *Journal of Applied Psychology* (49) will have a direct bearing on educational psychology in that it includes studies of individual mentalities, such as types of character, special talents, genius and individual differences, including the problems of mental diagnosis and vocational prognosis, and the psychology of everyday activities, such as reading, writing, speaking, singing, playing games or musical instruments, sports and the like.

Tendencies in Educational Psychology.—From questionnaires filled out by 53 professors of educational psychology Hall-Quest (39) finds that educational psychology as now taught in our colleges and universities embraces the learning process, instincts, habit formation, individual endowment, the study of defective and exceptional children, the psychology of school subjects and its application to supervised methods of teaching, statistics, with general psychology as the essential prerequisite. Similar studies have been made by Smith (78), Fernberger (29), Peters (62), Vaissiere (92), and Pitt (64).

Kretzchmar (52) expresses his disappointment concerning the dearth of courses in pedagogy at the new Frankfurt University. Not only are the courses few and subordinate but they are given in most cases by lecturers and not by regular professors. Meumann (56) writes that the education of the people is not a new idea, but

one with which Germany must deal at the outcome of the war; it must have as its basis a strong, national consciousness, for in national feeling—a love of one's own people—lie the strongest foundations for unity and the preservation of learning.

After a survey of 400 investigations by members of the American Psychological Association, Baldwin (10) showed that about 80 per cent. of the psychologists were emphasizing individual psychology. A detailed differentiation is made between general psychology and mental tests based on the views of members of the American Psychological Association. Baldwin (7) also discusses the present status of the teaching of psychology in normal schools and Heilman (41) maintains that if the schools are ever to get the fullest benefit from psychology, they must employ specialists who have been trained in the use of psychology for the solution of educational problems.

Standards and Measuring Scales in Education.—The most significant tendency during the past two years toward the direct application of psychology to the processes of education is that of the formulation and extensive use of *measuring scales* which aim to establish norms for degrees of attainment in school subjects for the various grades or ages. All of these norms are necessarily tentative, some are very artificial and others have a good influence in helping to infuse a scientific point of view into education.

Among those who have applied scales extensively to state school systems are Asbaugh in Iowa, Buckingham in Wisconsin, Haggerty in Indiana, and Monroe in Kansas.

For the convenience of laymen Starch (80), Chapman and Rush (16), and Springer (79) have assembled selected scales and reprinted them in book form.

All of the so-called "scales" are based on empirical investigations and among those of special psycho-educational import are those in Arithmetic, by Curtis (21), Woody (97), Cobb (18), Jessup and Coffman (45), Haggerty (37), Smith (77); in Drawing, by Child (17), a text by Sargent and Miller (73) which throws much light on the problem of the psychological development of the drawing of school children through successive years and one by Ayer (4), which gives an analysis of the principles underlying the use of drawings as a means of recording laboratory data; in Geometry, Stockard and Bell (84); in History, Buckingham (14); in Language, Breed and Frostic (13), Cross (23), Jenkins (44), Sackett (69), Trabue (91); in Music, Seashore (76); in Physical Growth, Baldwin

(9); in Reading, Gray (35), Judd (50), Haggerty (38), Kallom (51), Pintner and Gilliland (63), Richards and Davidson (67), Starch (82), Schmidt (75), Thorndike (88); in Spelling, Arps (3), Ayres (5), Foster (31), Lewis (53), Otis (60), Sackett (71), Starch (83), and Winch (94); in Handwriting, Breed and Down (12), Freeman (33), Gray (36), Johnson and Stone (46), Nutt (59), Sackett (70), Schlag (74), Starch (81), Thorndike (89), Witham (95).

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CHILD PSYCHOLOGY

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Child psychology is becoming more scientific. The number of articles by trained observers who obtained their material under controlled conditions is increasing. The majority, nevertheless, are general in character and written by observers with rather limited scientific training.

General Discussion.—Bruce (12) considers the psychology of childhood in a style which catches the attention of the lay mind. Consistent with the lack of profound psychological knowledge is the effort to bring the doctrine of the unconscious or subconscious into the foreground. Guyer (27) has an interesting chapter on the relation of the inherited mechanism to the child's behavior. Forbush in one book (23) discusses the various activities of the child in play, at home, and in school. Guidance is given in the study of the child's interests, his vacations and amusements. A second book (24) is intended primarily for parents but may be studied by all who have to do with children. It is encyclopædic in character and should be used only as a reference book. The first part deals with mental and physical growth and the second gives answers to questions frequently asked by parents. A full index makes the material easily accessible. Scott (54) interprets children to their parents. She emphasizes the great possibilities and considers the nature of disobedience and the parents' responsibility for it. She inveighs against an autocracy in the home and makes a plea for the careful study of the child. Crawford and Fogg (14) show the relation between the child's art expression and the evolution of the dramatic arts. Drummond (20) in a new and enlarged edition includes discussions of the "Montessori method" and of "Children who never grow up." Tanner (60) has rewritten and considerably enlarged her work. McManis (44) attempts to present psychology in its functional aspect and considers the plays and games, the instinctive

activities and mental characteristics of children. The syllabus is based on the theory that it is better to study individual cases than the child as a type or children in general. A new journal (33) has appeared. Its first volume is historical. In the second volume Van Wayenburg discusses child life, dividing it into periods "as he determines them to be for pedagogical and psychological studies," and Gunning "takes up the problem of influencing the will of children." Waddle and Root (65) present a syllabus and bibliography of child study.

Kindergarten and Montessori Methods.—The relation of the kindergarten to the activities of the first grade and to the Montessori Methods is becoming an important section of our discussions in child development. Atwood (2) discusses the activities of the kindergarten and their relation to the primary grade. Palmer (48) deals with the same problem and advises quietness in occupations, more independence in handwork periods, and the introduction of reading and writing into the curriculum of the kindergarten. The correlation of the two classes is apparently more important than the fundamental requirements of the child. Kilpatrick (34) in his usual keen way discusses the reform of kindergarten theory and practice. Additional elements are recommended for the kindergarten curriculum. MacLear (41) insists that old material can be discarded and new procedures adopted to keep the kindergarten in line with progressive principles and urges the adoption of some Montessori methods to rejuvenate the kindergarten procedure.

Vocabulary and Speech.—A good basis for the determination of the vocabulary of children is urgently needed. Observers of child language work independently and give little heed to the methods used by others. Brandenburg (10) reports the vocabulary of a three-year-old child to be 2,282. This child used the first word, "bye-bye," at 10 months and at 12 had added three other words, papa, mama, and baby. In teaching this child, all "baby-talk" was avoided and it was noticed that her sentence structure deteriorated during three months when she had companions of her own age. Words are stored in the subconscious realm and nouns are stored more rapidly than verbs. In a second study (11) in collaboration with the child's mother this author considers language development during the fourth year and compares the fourth-year vocabulary with the third. By the end of the later year the vocabulary has become less egoistic, relating more to nature, people, and abstract ideas. Drever (19) continues his study of children's vocabularies

and insists that there are three factors influencing the vocabulary, as shown in the use of nouns, of verbs, and of pronouns, adverbs, prepositions and conjunctions. Nice (47) continues her record of the vocabulary of an 18-months child, recording the vocabulary at various periods and showing the proportion of different parts of speech. The use of the different parts is in the following order, nouns at 14 months, verbs and adverbs at 16 months, interjections and adjectives at 17, pronouns at 22 and prepositions and conjunctions from 24 to 25 months. Bateman (3) supplies the vocabulary of a girl from 28 to 36 months and also presents that of a child for the first year. He discusses the words which should be included in a vocabulary, the acquisition of and progress in speech and the connotation of words. Langenbech (37) says that the vocabulary of a five-year-old child was 6,837. This was a precocious child who had shown natural development and at the age of five by the Binet-Simon tests graded eleven years. In order to get the vocabulary, every word used between the fifty-fifth and sixtieth month was recorded. Thomson and Smith (63) using a modified form of Kirkpatrick's vocabulary test, report the recognition of words by 467 children, ranging in age from 9 to 14 years. The results differ somewhat from Kirkpatrick's but he states that the numbers are insufficient for definite conclusions.

Consideration of defective speech is becoming more common. Blanton (7) reports the survey of all children in public and parochial schools in a city with a population of 30,000. He divides speech defects into three classes, stuttering, lisping, and miscellaneous. Individual children were examined and five per cent. were found to be suffering from speech defect. This is considerably larger than the ordinary percentage and he shows that it is related to feeble-mindedness and neurotic conditions. Wallin (66) by the questionnaire method collected statistics of speech defect among 90,000 children of St. Louis. He found that 14 out of every 500 children have some form of speech defect. Of these about one fourth were stutterers. Hinckley (30) presents the case of a five-and-a-half-year-old child who, although not deaf, had never used spoken language. She outlines the development of his speech and discusses the difficulty of various sounds. Stevens (56) considers the method of treatment for stuttering which she classes as a disease and not as a bad habit. "It is the expression of a psycho-neurotic state whose basic element is embarrassment or fear." Methods of treatment are summarized but there is little to indicate why class

work has limited value. Swift and Hedrick (59) discuss the various forms of movement which stutterers make in order to begin speech. The "starter" consists of any accessory motion or action gotten up by the patient to help his speech action. The efficiency of the starter consists in the diversion of attention.

Natural Education.—A considerable group of people realizes that education should be based upon the instinctive or fundamental reactions. Stoner (57) insists that a child should never be permitted to say "I can't" nor should he be frightened, ridiculed or scolded. An answer to a child's questions should never be refused. These are some of the psychologically sound tenets for natural education. Wiener in his translation of Pastor Witte's (69) book makes available for English readers a book published nearly one hundred years ago. It outlines the educational procedure of a father who believed that all children would profit much by systematic education from birth. Fisher (22) makes a plea for greater freedom and an expression of individuality in education and discusses the ways in which parents and teachers interfere with development. Read (51) presents in non-technical language the gist of scientific reports. Fundamental principles and facts rather than the rule-of-thumb procedure are considered. Berle (5) outlines methods for the instruction of young children and considers the problems of foreign language, botany, zoölogy, geometry, etc. Play is one of the fundamental reactions of a child and it has proved of great value in mental and physical development. Lee (38) insists that play should not be so strongly contrasted with work, since play is the serious business of childhood and as such is similar to work for adults. He divides childhood into four periods, three of the periods being characterized by some specific feature, such as the "dramatic age," etc.

Exceptional Children.—Grouping children as though they were a homogeneous mass is no longer acceptable to progressive educators and psychologists. We are hardly ready to accept the statement "Science has already furnished us with a means of identifying exceptional children, and of measuring the amount of their exceptionality so far as intelligence is concerned," which Garrison, Burke and Hollingworth (25) make in their report of one exceptional child. Reading the title leads one to expect that it is a child of great physical proportions but "the child is of that degree of exceptional intelligence possessed by but one child in more than a million." An illustration of his maturity is in the vocabulary test in which he defines *scorch* as "what happens to a thing when exposed to

great heat." Terman (62) compares the intelligence quotient with school progress and finds that many children are accelerated who are retarded when the chronological age is considered. He reports that according to the teacher's testimony exceptionally bright children are as healthy as average children; they are nearly always socially adaptable and are sought after as playmates and companions. As usual, efforts to provide means for dealing with the subnormal child result in valuable helps for the normal. The Hicks series (29) for atypical children is a group of psychologically well chosen stories. Holmes (32) describes backward children, gives a statement of causes for backwardness, and shows how permanent retardation may be determined. Hollander (31) emphasizes the importance of the exceptionally able child. Tucker (64) has a rather inadequate psychological knowledge for a discussion of the formation of habits. Wright (69) insists on the early education of the deaf child who should be "talked" to, attention being called to the lip movement, but no effort should be made to teach him to talk, since this requires the services of an expert. Peters (49) discusses the power of discrimination of primary and secondary colors among abnormal children who have no color names. Peters and Lazor (50) present a discussion of two children, one with marked ability in arithmetic and the other with a marked defect.

Physical Characteristics.—Since physical and mental development are supposed to go hand in hand, the development of physical characteristics is important in evaluating mental development. Tanner (61) gives a very important summary of the facts relating to a child's development including the special sense organs, reflexes, and instinctive movements. Dunham (21) outlines the physical characteristics which should be considered in grading intelligence. Myers (46) relates the various movements of a child during the first year of life. He reports touch sensation on the first day but "gentle, careful touch" did not appear until near the end of the eighth month. On the fifty-second day the child grasped strongly enough to support its own weight. de Busk (17) correlates vital index with school grade and mental age, those children with a high vital index being most mature. Smith (55) finds that among normal children five per cent. are left-handed and says that the high percentage of left-handed among the blind, the feeble-minded and the delinquent calls for further study and explanation.

Intelligence Scales.—From the Training School at Vineland there have issued two publications (6) of great value, being trans-

lations of all the known works of Binet and Simon which refer to the development and grading of intelligence. The first volume is concerned with general questions such as the establishing of a scientific method of diagnosis and the development of intelligence. The second volume discusses the intelligence and language of the feeble-minded and the relation of feeble-mindedness to dementia. Saffiotti (52) summarizes the attempts to measure intelligence. He was among the first to try the Binet tests and he compares the results obtained by his own method with those obtained by the Binet method. De Sanctis (18) discusses the measurement of intelligence and the mental development of the feeble-minded, the causes of deficiency and the detection of abnormal pupils in school. Types of schools and methods of teaching for the mentally deficient are considered.

Special Topics.—Kimmins (35, 36) in two articles discusses the interests of children of different ages in the war and in the hostile air raids. In the first article he had 3,081 children of ages from eight to thirteen write an essay about the war. There is shown a decided change of interest from year to year but in every case the child's interest was in the immediate happenings. There was considerable sex difference and one of the most marked characteristics was the maturity of the girls of thirteen. The second report from approximately 950 children gives similar results. Bateman (4) attempted to ascertain the color naming ability of 591 school children of the first three grades. The earliest recognition of color he reports at 16 months but 22 months is the usual age. More than 95 per cent. of these children passed the Binet test for recognition of four colors. The accuracy of naming increased with one semester spent in school and it is evident that American children are better than European children in this respect and could learn colors by the age of four. Lucas (39) following an earlier report on immediate recognition of numbers for a child three years eight months old, reports that at four years nine months seven objects are immediately recognized. More than seven must be laboriously counted. MacPherson (42) discusses the acquisition of skill in music and the awakening of an intelligent appreciation. For this topic the author requires more psychological knowledge than he apparently possesses. Sargeant (53) as a result of experience in the elementary school of education at the University of Chicago emphasizes drawing as a means of intellectual expression. A desire to tell something is the motive and improvement in this expression

is along specific lines and is not a general characteristic. Boyd (8) asserts that not enough attention is given to the ordinary questions which a child asks, while too much has been given to speculative questions concerning the nature and origin of things. He therefore recorded for one week at the three periods of three and a half, four and a half and five and a half years of age all the questions asked and incidentally recorded other questions asked between the ages of two and six. The number of sentences which were questions decreases after four years. This decrease "could only be attributed to mental growth." Guillet (26) discusses the meaning of words for a child at four, seven and ten years of age. He shows that the notion of three successive stages of "no content," "wrong content," and "partial content" is not well founded. The only possible conclusion is that children are liable to "guess" at words which they do not know. Day (15) records his own development in the production of a newspaper beginning at the age of five and running intermittently to eighteen. It reveals the earlier individualistic trend and indicates the development of the social point of view. In Malcolm's (43) report there is good material for the study of child psychology. This book contains stories written by a ten-year-old child and as first-hand material merits attention. Similar first hand material is given in Stoner's (58) "Facts in Jingles" written by this remarkable girl between the ages of five and twelve. Mabie (40) presents a first-class edition with colored illustrations of some of the always enchanting and ever engaging fairy tales. Boyd (9) considers the question of children's dreams. He says Freud's theory "is based entirely on the analysis of the adult mind and [with few exceptions] no attempt has been made to throw light on the questions it raises by the direct observation of children." He combats the notion that unfulfilled rather than suppressed wishes are responsible for all children's dreams. According to him "fear is as fundamental as desire in the subconscious promptings that issue in dreams." Hall-Quest (28) suggests that serious breaks in the adaptation of a child to succeeding environments are to be avoided. Advantage should be taken of the fundamental instincts. The right to play and the exercise of curiosity and imitation should never be refused.

Experimental Studies.—Winch (67) would answer the question whether or not words which have been learned in one situation are available for use in another. Is specific teaching of spelling necessary or wise? Eight experiments are tried, and the conclusion is

favorable to specific teaching since words which have been learned in lists may be spelled correctly in original composition. Mulhall (45) experiments on the ability to recall and recognize words, geometrical forms and nonsense syllables. On the basis of results for 638 children she concludes that a child's memory improves with age and grade and that girls are better for words and syllables, whereas boys are better for forms. Anderson and Hilliard (1) used a wide range of tests for 115 unselected children. They find considerable variation in ability and sex differences in most of the results. Dearborn, Anderson and Christiansen (16) describe eight different tests and give results for them stating that these are intended as alternate or equivalent tests where similar ones have been used frequently with the subjects. Carey (13) on the basis of results in tests and of marks obtained for various school subjects and the correlations among them attempts to answer the question whether or not there is a "general factor" in mental performances. In reference to the tests the evidence is not clear and in reference to the school work the conclusion is reached that there is a clear indication of the general factor but that as complications there exist other factors. Children with motor skill frequently lack general ability and the existence of a strong association between written words and their significance is a specific function in a certain number of subjects.

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SPECIAL REVIEWS

The Psychology of Special Abilities and Disabilities. A. F. BRONNER.
Boston: Little, Brown & Company, 1917. Pp. 269.

The author notes that no attempt has been made as yet to formulate specifically the problem of specialized abilities and disabilities, and that nowhere else have special defects been outlined and nowhere can one find even enumeration of the types of variation that are practically important. In this book "an attempt has been made to discuss practical aspects of special abilities and disabilities, to offer in detail methods of attacking problem cases, and to present various types, both (a) of particular disabilities in those who have normal general ability, and (b) of particular abilities in those who are below normal in general capacities." Special abilities and disabilities in number work, in language, in mental processes, under the topics of memory, inner visual function, work with concrete material, speed of reactions, perceptual abilities and higher mental processes, and in mental control, are considered from the educational and social points of view, and illustrated by some forty-eight selected case-studies reported in full from the author's experience in the Juvenile Psychopathic Institute of Chicago.

The psychological theory and practice of the author, by statement as well as by implication, is that "the mind represents a multitude of independent functions, and we can expect to find defect or exceptional ability existing in any one function or in activities involving various combinations of functions." These functions include "sensation, perception, apperception, imagination, memory, association, judgment, and reasoning, as well as the emotions and will, the latter involving inhibition and initiative." "To this list must be added the processes concerned with motor reactions." "Or we can think of our problem in terms of reactions which in themselves involve various combinations of the above mental processes. From this viewpoint we can study ability in the realm of number work, language, reading, spelling, handwork and the other school-subjects. Then, too, there is the whole question of complex functions, such as foresight and general powers of self-control."

Having made this analysis, the author then informs us that, "In both normal individuals and defectives it is necessary to test the different mental functions in order that where special abilities exist, they may be brought to light. The only generalization that needs emphasis is that in order to discover special gifts there must be a search for them. That is, a wide enough range of tests must be used to give each individual a chance to display his capacities." The measuring scales of general intelligence—"if there is such a thing" (p. 15)—are inadequate for the author's purposes because "the mental functions tested thereby are, in general, quite similar"; "none includes tests for a wide range of different functions; indeed, many mental functions are not tested at all, and thus we are given very few clues to particular abilities and disabilities." Fortunately, "there are now many other tests available for the study of various mental processes; the number is almost legion and new ones are being devised rapidly. With the means now at hand a fairly wide range of capacities can be studied." "For determining an individual's success in solving problems involving concrete material many tests are now in use, . . . for which norms are being established and which either are or soon will be ready for general use." "Any differences which may be found in readiness of learning, where the problems are presented thus concretely as opposed to problems presented in the abstract form, become very significant from the standpoint of educational method." "Other tests are especially adapted to study the powers of apperception. The ability to size up a situation and to grasp the general meaning of it is exceedingly important in all activities of life." And so we have "tests for" the numerous other "powers," for memory of various kinds, rote and logical, visual, auditory, etc., for association, for reasoning, as a whole, and for the separate elementary processes, ability to form mental representations, to analyze, to compare, to form judgments. "We find that for the study of powers of mental representation there are the well-known Cross Line and Code tests, which involve analysis and to some extent other functions as well, since visual or motor imagery may play quite a rôle." The author notes that in the function of judgment, "we must remember, of course, that incidental to many tests one can determine the subject's ability to judge." Mention is made of tests for studying powers of psychomotor control, for evaluating mental control, for determining ability to follow directions, and to formulate generalizations. At the close of the chapter on "Methods of Diagnosis" the author incidentally

suggests that the clinical psychologist "must have the ability to analyze the results ('of a wide range of tests') since often it is not sufficient merely to compare findings with established norms."

In the chapter on "Special Defects in Number Work" an attempt is made to analyze the arithmetical processes and determine the mental functions involved. After a discussion of the literature on the subject, the author arrives at the following analysis: "(1) The concept of number is built up through actual experience in handling objects. (2) On the basis of this active experience there is evolved a comprehension of the function of number on the one hand, and of numerical relationships on the other. (3) To succeed in the process of evolving a complete concept of number, the child needs to analyze and compare, to discriminate, and finally to abstract; that is, there must be ultimately a transition from concrete to abstract. (4) Memory processes are implicated and particularly essential in the mechanical aspects of number manipulation. (5) Arbitrary association is an element in the learning process." "If now, in our study of individual problem cases, we find a child who is greatly retarded in number work, who seems to be incapable of normal advancement in this subject, it becomes necessary to make an intensive investigation by means of psychological tests, that we shall be able, if possible, to determine wherein the difficulty lies. If we know the psychological processes involved in the learning of arithmetic, we ought to test these various mental functions in the individual in order to find which are normal and which are not." There are presented a number of case-studies of inability in number work illustrating exceeding defect (the other number functions being normal or above normal) in auditory memory for numbers, poor powers of forming associations with symbolic material, concept of number lacking, and inability to go from concrete to abstract, respectively. Similar treatment is given in the chapters on "Special Defects in Language Ability," and on "Special Defects in Separate Mental Processes." Of the "higher mental processes," which include "powers of apperception, reasoning, judgment, mental representation, and foresight," the author says that they "are naturally criteria of intelligence to such an extent that defects in these aspects of mental life would seem to indicate subnormality, if not feeble-mindedness. But as a matter of fact, there are individuals who lack some one of these mental powers, yet who do well in many other tasks not involving the defect." In the discussion of "Defects in Mental Control," as might be expected, we have

case-studies of individuals "otherwise quite normal mentally and physically," and we are told that "the power to awaken inhibiting ideas and to keep such thoughts in the foreground of consciousness so that they may become effective, is a power as truly characteristic of mental life as is the capacity for recalling past experiences or for performing any other mental function." The chapter on "Special Abilities with General Mental Subnormality" treats the opposite type of mental irregularities and the author recommends that "indeed, the type of research presented in this chapter should be greatly extended in the future, that all the unitary functions and powers may be known."

The great contribution of this interesting book consists in a simple change in a preposition, but a change of tremendous scientific and practical significance. Heretofore psychologists have cautiously spoken of *tests of* perception, memory, etc. This book speaks throughout of *tests for* these processes. These processes considered as "powers" is, of course, not new. The flourishing science of phrenological psychology has been greatly advanced.

SCHACHNE ISAACS

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How to Study Effectively. G. M. WHIPPLE. Public School Publishing Co. Pp. 44.

Dr. Whipple has limited himself to presenting a series of rules or maxims which if intelligently followed will make for effective studying. The rules are simply worded and succinctly presented. They concern the physiological condition of the student, the correct physical arrangement of "tools," as lighting of study table, time and place of study, hints as to effective motives for inducing study, and rules for recording and memorizing material.

No attempt has been made to introduce new or experimental material. This is an advantage, as such material would detract from the didactic power of the book. The book frankly aims at helping the junior student rather than the more advanced worker. The rules are arranged logically, from simple to complex. They are carefully chosen and are all fully justified by the facts of experimental psychology.

The book is a really valuable one, and cannot fail to help such students as read it carefully. Benefit would certainly be derived by members of the ordinary college freshman class if they were required to read it.

How to Learn Easily. G. V. N. DEARBORN. Boston: Little, Brown. Pp. 221.

The book by Dr. Dearborn aims to deal with the same general problem as Dr. Whipple's book. The books are, however, constructed on entirely different principles. Dr. Dearborn has written much the longer book. It is rather discursive in form and one may wonder whether the average freshman would profit much by it. But, no doubt, the book is intended for the teacher quite as much as for the student, and may interest him much more.

The first chapter on economy in study treats of conscious and subconscious learning. The importance of the latter is emphasized, as perhaps it should be from some standpoints. Some practical advice as to study methods is also given. The discussion of observation and note taking is somewhat drawn out, and may not benefit the student searching for aid as much as fewer and more pointed paragraphs would. In the chapter on educative imagination the author introduces a good deal of material from his own experiments in free association induced by observation of ink blots. Most of this material has been published before. Its value, for this book, is problematical. A discussion of books and their educative use seems to me the best chapter of the book. The two final chapters are popular in form and that on examination preparedness contains many hints which those facing this ordeal might, perhaps, read with profit. But one wonders whether it is worth while, in these days of economizing, to use good printer's ink advising students to have two fountain pens filled, to write legibly and to write good English.

On the whole the book is well worthy the attention of those who are interested in getting the very best results from the time spent in study.

GEORGE R. WELLS

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NOTES AND NEWS

THE present number of the Bulletin has been prepared under the editorial direction of Professor Bird T. Baldwin, of the State University of Iowa.

PROFESSOR B. T. BALDWIN has been appointed head of the division of educational psychology and director of the new Child Welfare Research Station at the University of Iowa.

SPECIAL courses to train psychological examiners who may be needed by the Government for the mental examination of recruits are being conducted at Cornell University under the direction of Professor R. M. Ogden.

By vote of the Council, the meeting of the American Psychological Association will be held in Pittsburgh at the Carnegie Institute of Technology, December 27, 28, and 29, instead of in Ann Arbor.

PROFESSOR KNIGHT DUNLAP and Messrs. E. Bagby and S. Isaacs, of Johns Hopkins University, have accepted positions in the Government service in connection with investigations of aeronautic problems.

MR. DAVID A. ANDERSON, formerly associate Professor of Education in the University of Washington, has accepted the headship of the department of psychology and education in the Pennsylvania State College.

PROFESSOR J. McK. CATTELL has resigned from, and Professors J. R. Angell and W. B. Scott have been added to the Psychology Committee of the National Research Council.

By action of the Board of Trustees of Columbia University, Professor J. McK. Cattell has been removed from the professorship of psychology.

THE following items have been taken from the press:

At Dartmouth College Charles L. Stone has been appointed instructor in psychology.

At Oberlin College Dr. Edward S. Jones, of Northwestern University, has been appointed professor of psychology, and Dr. C. C. W. Nichol, assistant professor of psychology, has been appointed acting dean of college men.

MR. E. A. DOLL, assistant psychologist in the Training School, Vineland, N. J., has accepted a position in the department of psychology at Princeton University.

MR. ARTHUR S. OTIS, of Stanford University, has been appointed assistant psychologist in the Training School, at Vineland, N. J.

THREE Iowa college professorships in psychology for the coming year have been filled from the graduate college of the State University of Iowa. Dr. Marie Andrew goes to Buena Vista, Dr. Merle Thompson goes to Morningside, and Dr. Nesta Williams has accepted a professorship at Central College.

THE
PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

METHODS AND PRINCIPLES IN SOCIAL PSYCHOLOGY

BY JAMES H. LEUBA

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That social psychology is still in its infancy may be inferred from the number and the nature of the methodological discussions and from the many attempts made to differentiate it from sociology on the one hand and from psychology on the other. A review of recent literature shows that the confusion arising from our real ignorance with regard to these new scientific domains is much increased by terminological difficulties. Different meanings ascribed to "objective," "psychological," "scientific," "mental," and other terms are chief sources of confusion. Those, for instance, who would altogether exclude psychology from the social sciences, do not mean by that term the "psychology" of the behaviorists, which for some psychologists is the only psychology. If nothing more can be achieved at present, a definite understanding as to the use of these terms is at least within the immediately realizable. In this review, however, I have not found it practicable to use them always in one and the same meaning. I have on the whole, in the case of each particular author, used them as he did. The context will, I trust, indicate the meaning.

Ellwood (4) in a vigorous paper defends the use of subjective terms by the sociologist not because he does not desire an objective treatment, but because our ignorance of the neural correlates of such subjective facts as desire, opinion, value, etc., makes it impossible to speak altogether in objective terms.

The radical objectivists have been few. Durkheim was only half-hearted in his rejection of what he calls "psychology." "In-

stead of going on to construct a sociology in terms of the behavior complexes of the aggregate and its environment, he accepts the hypothesis of a 'social mind,'" and takes into account "'collective representations' such as public opinion, popular belief, social tradition, popular will, and the like." These are for Durkheim social facts, *i. e.*, something entirely distinct from biological and from psychological facts, for they are facts exterior to the individual. This objectivism appears to Ellwood to be worse than the subjectivism from which Durkheim strives to be clear. It is really a metaphysical conception "since we know of no 'social' as distinct from the biological and psychological." A truly objective sociologist would not, in Ellwood's opinion, use the terms "social mind," "public opinion," "tradition," and the like; "for public opinion, for example, can after all be nothing but some organization or combination of individual opinions and it surely does not lose its psychic nature by becoming socially organized. The socio-psychic is as definitely psychic as the individuo-psychic. . . . The only way in which the psychic element can be got rid of in the social sciences is to interpret all social processes in terms of behavior complexes (habits) and environment stimuli."

We may compare with the above Bentley's opinion (I) that the "objects" of which the social sciences treat are "for the greater part, *mental* objects, but not *psychological* objects; mental in the sense that 'mathematical' and 'imagined' objects are mental." There is, this writer holds, in addition to the objects that belong to the physical order and those that belong to the realm of mind, a third class of objects constituted by the formal organizations of society (the church, the club, the state) and the products of mind (language, opinion, beliefs, etc.). So far as these things are regarded "apart from the fluent processes and functions from which they take their origin or derive their means of continued support," they do not belong to social psychology (p. 13). With these, regarded as "objects," the social psychologist is not concerned. He deals with "mental processes and mental functions" (p. 13). Bentley makes thus a sharp distinction between social psychology and sociology. But the behaviorists in psychology and the objectivist of the type of Zeligson in sociology, would say that no science of any sort can be built upon the concepts of mental process and mental function unless these terms are deprived of all reference to consciousness. This curtailment is obviously not intended by Bentley. We shall see that in his understanding of the relation of

sociology to social psychology, Ellwood is at one neither with the radical behaviorists nor with Bentley.

The only consistent objectivist in sociology is, according to Ellwood (4), G. P. Zeliony, a docent in physiology in the University of Petrograd. He may also with equal propriety be called a behaviorist of the Watson type. Zeliony affirms boldly that the true sociologist does not know the conception denoted by the words "marriage," "crime," "family," etc. Assassination is for him merely the killing of one person by another under certain definite objective circumstances. A man raises his hand to strike another. The only possible scientific explanation of this phenomenon is one that establishes the connection between the raising of the hand and the physical and physiological antecedents. What goes on in consciousness in connection with that action does not concern the scientists, for "the conception of consciousness cannot have a place as a scientific designation of a natural phenomenon." True science disregards mind. Thus understood sociology becomes collective physiology.

Ellwood would not oppose the execution of Zeliony's program. "Let the objectivists follow up their new clue to the social process as far as it will go,"—that is what all psychologists should say to the behaviorists, in whatever field they may be found.

But does physiological sociology really provide the only account of social life to which the name "science" can be applied? The answer to this question involves the meaning of the word "science"; it is obvious that our authors do not use it identically.

Ellwood brings the following objections against Zeliony's dogmatic objectivism. It implies the denial of any cause outside of material causes. Now, the mechanistic conception of life is a working hypothesis serviceable within certain limits and for the solution of certain problems; but we find it here erected into a dogma of universal application. Zeliony's science is founded upon an "ultra-scientific" doctrine. That doctrine is unacceptable to the sociologists, for civilized man "lives in an ideational world. For him the world of real objects is largely replaced by a world of ideas, standards, values. . . . Human history thus presents itself as a growing tradition, or 'social mind' which cannot be understood apart from its content." And our knowledge of the nervous system and its activity is so absolutely insufficient that "to substitute in our description of social processes the hypothetical activities of the cells of the central nervous system which have not yet been observed . . .

for ways of thinking and feeling which we well understand and which are, *ex hypothesi*, the exact correlatives of the physiological processes is sheer pedantry!" For the present at least, the proper scientific procedure is therefore to describe social phenomena partly in objective and partly in subjective terms.

As to the affirmation of Zeliony that the mind of others is not available for scientific investigation, Ellwood flatly contradicts it. Unfortunately, in the opinion of the reviewer, he conceives of the knowledge we have of other minds as originating in an intuition and not in inference: we know other minds "directly, as we know many of the qualities of physical objects."

But how is social psychology proper to be separated from sociology? If, for the radical behaviorists and objectivists, social psychology does not exist; and if, for many others, social psychology is a science sharply separated from sociology, for Ellwood the distinction is less clearly marked. One even finds passages in his books where all distinction seems obliterated; in this sentence for instance: "A scientific description of social life must be in terms of conscious processes if it is to be intelligible to us." His meaning is more exactly expressed, however, in this passage: "The psychological part of sociology, that is social psychology, it is evident, therefore, is its most important and fruitful part; while psychology itself is the chief antecedent science from which sociology must obtain its principles of interpretation" (p. 8 of the Introduction).

In the volume commemorating Titchener's twenty-five years of service to psychology, Washburn (II) points out that the "profound and striking differences which exist between the social psychology of man and that of the lower animals as a class are due to the presence in man of a factor which can be most concisely described in introspective terms." That factor, called by the author "ejective consciousness," is "the awareness of thoughts and feelings as belonging to other minds than our own." The presence in man of that factor "substitutes mental for physical causes of social behavior."

It is not denied that ejective consciousness has a motor or behaviorist basis, but merely that it is impossible for us to describe that motor basis; whereas ejective consciousness is discoverable by introspection. Washburn's attitude is therefore in this respect identical with that of Ellwood and of many other social psychologists.

Kenagy's (8) viewpoint is that of the radical behaviorists. He

argues against the introduction of consciousness, whether as pleasure-pain or idea, in the description or explanation of social life. Much of his paper is directed against Ellwood. Fault is found with him for speaking of thought and feeling as if they "guided," or "controlled," or "mediated" human action. Ellwood has nowhere, so far as I know, taken a dogmatic position regarding the metaphysical question of the relation of mind and body. It does not seem to him necessary for the student of sociology to take sides in the quarrel between psycho-physical parallelists and interactionists. He was, therefore, quite consistent in not avoiding the ordinary forms of speech in which consciousness is spoken of as causally effective. In the preface to his last book (3) five reasons are offered in support of the thesis that "from the nature of the phenomena with which they deal" radical objectivism in the social sciences is impossible. The more important of these reasons have already been stated or implied. He has, moreover, expressly declared in an italicized footnote (p. 9) that when he uses subjective terms like mind, feeling, idea, belief, value, psychic process, etc., they must be understood to include the correlated neural processes.

The refusal to take sides in the question of the relation of mind and body has a troublesome consequence. It is practically impossible to avoid writing at times as if one believed in interaction, and at other times as if one accepted the parallelistic doctrine. Thus one *seems* to affirm both in turn, according to convenience.

Although Kenagy holds that conscious processes are never causes of action, he does not regard them either as "superfluous or parallel" to physiological activity. "Imagery," he tells us, "is the evidence of associations and neural activity between stimulus and response," and feeling is "the sign of the whole act of which it is a part." Whether he regards this as a mere statement of fact or as a metaphysical doctrine, does not appear.

The radical behaviorists who build upon the theory of materialistic determinism, and those who do not commit themselves to any metaphysical theory, are not altogether alone in the social sciences. Coe's (2) *Psychology of Religion* (reviewed in this number of the BULLETIN) is written from the spiritualistic standpoint. His metaphysical position is partly indicated in this passage: "In short, there is at work, on the functional side, a principle of personal-social integration that is no appendage of the physical conditions of life, but a user of these conditions for purposes of its own. In this use of conditions the nature of the conditions is in part discovered" (p. 300).

Attention may also be drawn in this connection to McDougall's (9) chapter on Theories of Action which he has added to the enlarged edition of his much-read volume. We find here stated briefly the anti-mechanistic thesis which is defended with unusual thoroughness and competence in *Body and Mind*. Its application to sociology is indicated in the following passages. The facts of behavior "must be explained in terms of fundamental conceptions proper to psychology as independent science," *i. e.*, "in terms of the conception of purposive or appetitive process." "The acts of human beings, all our volitions, our efforts, our resolutions, choices, and decisions, have to be explained in terms of the laws of appetition. When, and not until, we can exhibit any particular instance of conduct or of behavior as the expression of conative tendencies which are ultimate constituents of the organism, we can claim to have explained it." The merely cognitive process of representing or conceiving the end or the course of action is not regarded as sufficient to evoke the action; it merely serves to guide its course in detail.

Ferrière (5) also must be placed in the class of those who oppose mechanical determinism regarded as a principle adequate for social science. In the *Introduction Philosophique* to his substantial volume (pp. 53-80), conscious volitions are set forth as forces contributing to the formation of human societies. "One must," says he, "in order to establish scientific social laws and a critique of historical evolution, take account primarily of subconscious phenomena and only subsidiarily of the conscious actions of individuals—the first represent the element of regularity, of constancy, of permanence; the second, the accidental and contingent" (p. 78). Between sociology and psychology, Ferrière makes this distinction: both study the same "spiritual forces," but psychology studies the manifestation of these forces in the individual and sociology in the group (p. 58).

The necessity for a more exact and uniform terminology is brought home by Clark Wissler (12) in an address as chairman of the section of Anthropology and Psychology of the A. A. A. S. He is, of course, an "objectivist"; nevertheless he jeers at those objective psychologists who seek to account for the appearance of social institutions, such a religion, by reference to a "definite mode of action in man's nervous system." Curiously enough, he writes further on, still with reference to "religious activities," that "the psychologists seek their origin in universal psychic activities."

"Action in man's nervous system" and "psychic activities" seem to be used as equivalent terms.

As a student of anthropology, Wissler desires historical explanations. In religion, for instance, "the ideal would be to state where, among whom, and under what conditions" appeared the several elements of the religious complex. Anthropology, as he defines it, is concerned only with "the activities of man acquired by learning." To differentiate correctly between the innate and the acquired, is therefore a necessary preliminary. Here, if nowhere else, anthropology comes into close contact with psychology. This address will be read with profit by those who wish to know how far we are from having attained clearness in the understanding of the methods proper to the several branches of social science, and in the apportionment between them of the problems now waiting for solution.

The debate between the upholders of the unitary and of the multiple and independent origin of culture continues unabated. Rivers' great *History of Melanesian Society*, and G. Elliot Smith's (10) article, which contains an outline of the chief feature of his forthcoming book, have elicited vigorous protests from A. A. Goldenweiser (6, 7) and others, on the ground of their disregard of the second of these theories. Goldenweiser accuses Rivers of using culture diffusion "not as a process to be demonstrated but as one to be assumed for the purpose of hypothetical culture building." For Goldenweiser the theory of diffusion and that of independent development possess equal status. A difference between them must, however, be borne in mind: diffusion can be demonstrated; while independent development does not, in the nature of the case, permit of rigorous proof.

The multiple origin of cultural traits can be proved by the psychologists still less than by the anthropologists; but some support would come to that theory from psychology if that science was to demonstrate the existence of sufficient similarities in the working of the human mind to permit of the multiple appearance of certain cultural traits. I say "permit," for it is clear that certain definite external conditions must be realized before an invention or even a discovery can take place.

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SOCIAL PSYCHOLOGY

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Probably the two most important books of the year in the field of sociology and social psychology are Professor R. M. MacIver's *Community: a Sociological Study* (4) and Dr. Robert H. Lowie's *Culture and Ethnology* (3). Both books are somewhat negative in their attitude toward psychology in relation to social theory, but their value to the social psychologists is not less on that account.

Professor MacIver finds that the term "community" best expresses the object which sociology endeavors to study, rather than "society" or "association." In his analysis of "community" he holds that it is not to be thought of as an "organism" or "mind," but as "any area of common life" (pp. 21, 151) shared in some degree by distinct individuals. This common life, however, is made possible by psychical relations, relations of minds. While "community is no greater mind," yet "it is created by that activity of men's minds in which they relate themselves incessantly to one another" (p. 95). What relates them is *interest*. Hence "the interests of men are the source of all social activity and the changes in their interests are the source of all social evolution" (p. 99).

With such assumptions the reader expects Professor MacIver

to invoke the aid of psychology in the analysis of "community" at every turn. But this he does not do, as he holds that psychology is not concerned with the objective manifestations of mind in the social life. "All conduct, properly so-called," he reminds us, "is psychical, *but psychology is not therefore the science of all conduct*" (p. 60). He would limit psychology purely to the subjective side. "The other sciences," he tells us, "study the world of objects—not merely material objects, for our ideas and imaginations, our mental constructions of every kind, our institutions and social forms, are also objects of mind. . . . But psychology essays a more perilous task. It seeks to know mind, the knower; it seeks to complete the objective world of science by making the essential subject itself an object, and an object to itself" (p. 60). "When therefore we study laws or customs or any social institutions, in order to attain a knowledge of these things, we are not psychologists but sociologists" (p. 61). The author's attempt to make psychology a purely subjective science, and thus draw a sharp line between it and the social sciences, will scarcely meet with approval on the part either of psychologists or of a large number of sociologists. Nevertheless, the value of his "study" will be cordially recognized by most social psychologists.

Dr. Lowie's little book is a discussion of the relations of ethnology to a number of other studies. In successive chapters he discusses "Culture and Psychology," "Culture and Race," "Culture and Environment," and "The Determinants of Culture." He informs us that "culture is the sole and exclusive subject-matter of ethnology, as consciousness is the subject-matter of psychology" (p. 5)—a statement which the psychologist would scarcely accept so far as it pertains to psychology, but which suggests at once the close interrelation of what are called "cultural anthropology," "ethnology," "sociology," and "social psychology"; for all these surely deal more or less with culture or civilization.

Dr. Lowie contends that the science of psychology does not deal with *acquired* mental traits nor with the influence of *society* on individual thought, feeling, and will. "It deals on principle exclusively with *innate* traits of the *individual*" (p. 16). Inasmuch as culture is always "acquired," psychology at best only furnishes certain general principles to guide the student of culture. "Cultural facts," he says, "even in their subjective aspect are not merged in psychological facts. . . . The principles of psychology are as incapable of accounting for the phenomena of culture as is gravitation

to account for architectural styles" (p. 25). If Dr. Lowie's statement had been that they were not more capable of accounting for specific cultural phenomena than for architectural styles, most social psychologists would agree; but when he implies that psychological principles are as remotely removed from cultural complexes as is the principle of gravitation, we cannot follow him. When, moreover, he goes on to contend that "culture is a thing *sui generis* which can be explained only in terms of itself," and accepts the maxim, "*Omnis cultura ex cultura*" (p. 66), he gives up the viewpoint of natural science with its insistence upon the unity and filiation of all natural phenomena. For surely every cultural complex, as Dr. Lowie himself shows, is finally made up of psychological, biological (or racial), and geographical elements. Full scientific explanation of any particular cultural complex is not reached, therefore, until it has been analyzed into these different elements and some statement made even of the quantitative relations of each of these elements in the whole complex. This is the procedure of the social psychologist, though of course he clearly recognizes that in this analysis of a cultural complex he can offer only general principles, such as instinct, habituation, and stimulus to explain how specific cultural phenomena arose.

In spite of this criticism, however, Dr. Lowie's book is invaluable for the social psychologist, because it shows more clearly than perhaps any other work the limitations of psychology in the realm of social theory. These limitations should be, of course, constantly borne in mind by the social psychologist if his work is to aid the advancement of the social sciences. A brief, but sensible paper on this subject, though somewhat noncommittal, is Wallis's "Psychological and Statistical Interpretations of Culture" (6). The author takes it for granted that cultural complexes must be resolved into environmental and psychological elements. He points out that statistics alone can never show true causes, but they may give us clues as to the causes of the given social situation. By accumulating instances they increase the probability of a causal correlation between two things. "The correlation of psychic state with practice is not enough. We must know whether this psychic state is present irrespective of other psychic or physical conditions;" but psychic states may at times be true causes.

Almost the opposite view from Dr. Lowie's is implied in Professor Gault's paper (2). Inasmuch as he regards psychology as covering all behavior, and social psychology as the science of social

behavior, psychology in its modern form is adequate to deal with social relations scientifically. Professor Gault takes but two problems for illustration, one the problem of the motives, or the springs of social action, and the other the problem of social or group unity. He would find the principles of explanation, in both cases, in instinct and acquired habit complexes. Unfortunately, Professor Gault avoids certain issues which Dr. Lowie raises by taking temporary groups, such as the crowd, the audience, and the mob, as his starting point rather than cultural complexes. The cultural group, however, rather than the crowd has come to occupy more and more the center of the stage in social psychological investigations in recent years.

Perhaps the most valuable and suggestive paper in the field of social psychology recently published is that by Professor Dewey on "The Need of Social Psychology" (1). Agreeing with Comte and Tarde that "all psychological phenomena can be divided into the physiological and social," Dr. Dewey emphasizes that it is the social side of psychology which is of immediate practical importance, since both "mind" in the individual and culture are "acquired" traits. He decries attempts at oversimplification in social psychology and in social theory generally. "Henceforth it is," he says, "pure wilfulness if anyone pretending to a scientific treatment starts from any other than a pluralistic basis." Conceding, then, the complexity of all social situations and the necessity of a synthetic view of the social life, he would stress the inductive, objective study of social psychical phenomena. "The chief cause of the backwardness of social psychology," he thinks, "has resided in the artificiality of the endeavor to adapt the rubrics of introspective psychology to the facts of objective associated life." He would group social psychical phenomena, apparently, about objective problems in the social life, such as social unity, social continuity, and social change, rather than about such relatively subjective matters as sympathy, suggestion, and imitation.

At least one prominent psychologist believes that for the present we should not attempt to make use of psychology in the interpretation of social behavior; and that is Dr. W. H. R. Rivers, of Cambridge University, England. In a recent article (5) he returns to his familiar thesis that for the present the work of the social sciences should be confined to description and classification without attempt at explanation through psychology, because any principles borrowed from psychology would at the present time be so purely

hypothetical. He objects to the current definition that "psychology is the science of the behavior of living things." "This definition," he says, "is so wide that it would not only include the whole of sociology as ordinarily understood but also economics, politics, and ethics." He does not deny that the final aim of the study of society is the explanation of social behavior in terms of psychology. But to attempt this at present would be premature. For the present "the business of sociology is to ascertain what happens and what has happened before it tries to explain why it happens and has happened." He would not deny, however, the social theorist the right to use terms which are essentially psychological, such as beliefs, opinions, customs, values, and the like; but he would insist that as yet we have no adequate psychological principles to offer as an explanation of these social, psychological phenomena; rather that psychology itself must first be greatly developed through the concrete study of the organization and evolution of the social life before we can get at sure psychological principles.

Thus it is evident that there is much confusion still as to the exact bearing of psychology upon social theory and the place of social psychology among the sciences, a confusion which perhaps but reflects the present state of the world in general. The time has come, however, when it is evident that psychologists who wish to enter the field of social theory should not be mere dabblers in the social sciences; and on the other hand, that students of the social sciences who wish to make use of psychological principles in their interpretation of social life should not be mere dabblers in psychology.

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PSYCHOLOGY AND CRIME

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This year is notable for the publication of the first complete translation into English of Ferri's *Criminal Sociology* (13). While, as the title indicates, the discussions are predominantly sociological, the psychological aspects of criminality are by no means neglected. It is not, however, Ferri's contribution duly to evaluate the psychic factor in crime or to expound a social psychology of crime. He advocates the study of crime not as an abstract legal idea, but as a natural social phenomenon, bringing together the conceptions of Lombroso, Marx, and others concerning the etiology of crime. That is, he maintains negatively, that criminal factors are not biological, physical, or social forces acting in isolation from each other, and, positively, that criminal factors, under the three categories, anthropological, telluric, and social, are all the forces in the universe, working together in proportions varying with each criminal and with each crime. The economic forces receive greatest stress. The principle of social determinism is maintained throughout, though an attempt is made to expound it so that it may be seen to be in harmony with future efficient legal and social practices. Social defense is advocated as the principle for determining the treatment of criminals. This principle necessitates combining the study of the criminal with that of the ordinary procedures of police and judiciary. In this connection, Ferri sets forth a social theory of punishment and responsibility, a sociological conception of jurisprudence, a workable classification of criminals, and a series of "penal substitutes," viz., conditional, suspended, and indeterminate sentences, farm colonies, etc., that is, educational and moral reforms in place of repressive and retributory measures. "Penal justice" is "a kind of hygiene and clinic against the disease of crime" and, as such, is identical with true social defense.

The scope of *The Mentality of the Criminal Woman* (27) is indicated by the sub-title, *A Comparative Study of the Criminal Woman, The Working Girl, and the Efficient Working Woman in a Series of Mental and Physical Tests*. The main object of this investigation was to find a means of determining after conviction and before sentence of the criminal woman her "reformability" so that rational treatment might be undertaken. In particular, it was to find a series of tests whereby the reformable criminal woman might be

differentiated from the non-reformable. Reformability is defined to be ability to learn a trade, capacity to become self-supporting, and possibility to develop sufficient emotional stability to adapt oneself to social conditions. The author adopted, as a possible means of obtaining such diagnostic tests, the method of comparing criminal women with groups of law-abiding working girls and women as nearly similar as possible with respect to age, nationality, educational opportunities, environmental conditions, etc. The criminal women were eighty-eight women from sixteen to thirty-three years of age who had been sentenced to the New York State Reformatory for Women at Bedford Hills, New York; the working women were eighteen women from seventeen to thirty years of age who were employed as maids at Vassar College; and the girls were five hundred and fifteen girls, fourteen and fifteen years old, who were ready to leave school and go to work. The first groups were tested by the author; the last group was tested by or under the direction of Dr. Helen T. Woolley in the Bureau of Vocational Guidance connected with the public schools of Cincinnati. The tests used were the same in all three groups. The results are compared in detail and include under physical tests; height, weight, strength of grip, steadiness of hand, rapidity of movement, and index of fatigue and under mental tests; cancellation of letters, card sorting, memory for numbers, substitution, completion of sentences, and easy opposites. The body of the book is taken up with a statement of the problem, the selection and description of the tests, the classification of the groups under comparison, the original test records, and the social, industrial, and physical histories of the groups. Ninety-four tables and ninety-five graphs are presented.

Among the conclusions reached are the following: 40 per cent. of the Bedford women are decidedly less efficient in whatever is measured by the tests than is the average Cincinnati working girl of fifteen; about 33.3 per cent. of the former are at least as intelligent and as efficient in the qualities measured as is the average Cincinnati working girl of fifteen; and even the more intelligent of the Bedford women differ very obviously and unmistakably in stability and emotional control from the Vassar maids. Dr. Woolley intends to repeat annually her tests of these same working girls for a period of several years and to correlate with her results social, economic, and moral information about the girls, secured from time to time; so that her final conclusions give promise of furnishing the bases for judging the normality of the criminal woman. Dr. Weidensall

states that in the meantime her own investigation is to be considered as merely a preliminary one. Of great educational significance is the fact noted by the author that the criminal woman showed not so much an inability to perform the tests as a mental sluggishness in adapting herself to new conditions, a carelessness, indifference, and irresponsibility which have been fostered by long habits of working without trying to understand what she was to accomplish. Finally, the conclusion is stated that two thirds of the Bedford women are tractable and responsive; and that, other things being equal, an appreciable number of them may be trained to a reasonable efficiency and self-control.

The first four chapters of *Mental Conflicts and Misconduct* (18) are an exposition of mental conflicts, of the conceptions fundamental to the mental analysis that will reveal the conflicts as determinants of antisocial conduct, and of the methods of applying the conceptions to cases of juvenile misconduct. Chapters five to seventeen set forth forty case histories of juvenile offenders in whom mental conflicts were active as antisocial forces. These case histories are grouped together to illustrate various aspects of the phenomenon. Thus, one group shows obsessive imagery in clear relationship with conflict and misconduct; another group shows conflicts causing impulses towards social offenses; still a third group shows criminal careers as developing from conflicts. Again, one set of histories sets forth cases of conflicts which are easily analyzed; while another sets forth those which are analyzed only with difficulty. Some conflicts arise from secret sex knowledge; some are concerned about parentage or other matters. They result in stealing, running away, homicidal attempts, extreme bad temper and violence, extreme willfulness, destructiveness and disobedience, malicious cruelty and sadism, etc. The mentality of the delinquent through mental conflict is much higher than that of the delinquent from other causes. The delinquent through conflict experiences an inner urge to antisocial attitudes and conduct which is opposed to his conscious desires. The chain of causation is not perceived by him. The treatment essential is in general change of environment after the conflict is disclosed.

Time and again in Dr. Healy's studies of the causation of misconduct, the need of an investigation of special abilities and disabilities has been indicated as means of understanding and so as clues to the rational treatment of individual offenders. *The Psychology of Special Abilities and Disabilities* (6) is such an investiga-

tion of special abilities in the subnormal and special disabilities in the normal. The author discusses principles of diagnosis and gives forty-six case histories. Some of the disabilities cited are defects in number work, in language ability, in memory, and so on.

Of far more than the local interest implied in the title and subtitle is *Truancy and Non-Attendance in the Chicago Schools; A Study of the Social Aspects of the Compulsory Education and Child Labor Legislation of Chicago* (1). The authors consider the relations of truancy and non-attendance to mental and physical defects of children, to dependency, delinquency, and immigration, to the transfer system, etc. They evaluate the functions in the control of these matters of the parental school, the municipal court, the school census, and visiting teachers. They urge that the issuance of working certificates be in the hands of state rather than local authorities; that children between fourteen and sixteen be compelled to continue their education; and that not only a minimum of age but one of physical and educational development be required. In general the thesis is that the social and moral efficiency sought by our education, which is at the same time free and compulsory, can be attained only when that education is conducted in a way which at once takes cognizance of the social and moral background of each individual to be educated and "follows up" this knowledge in home and neighborhood as well as in school. Thus, involved in the problem of education, as such, are the problems of the health and housing of children and adults, the moral and mental attitudes of parents, the attitude of the prosperous classes to the welfare of the wage-earning and immigrant groups, the wage levels of unskilled labor, child labor laws, and the like.

Studies in Forensic Psychiatry (15) gives, in more or less detail, case histories in which the main features discussed and illustrated are mental ailments of prisoners, court room aspects of the monomania for litigation, simulation of mental diseases, and kleptomania. The author compels the reader's attention to the desirability of discovering the peculiar characteristics of types, especially of the genesis of these peculiarities, and to the necessity of making penal and reformatory institutions clinics for the study of the delinquent, if readjustment is to be attained.

The Offender (21) is a discussion of the various classes of delinquents and of the various methods of constructive treatment, probational and institutional. It is valuable because written by one whose practical experience in these matters has been very diversified and extended.

Periodical literature teems with studies of the criminal. Chapman (8) and Lane (20) comment more or less formally on the subject of crime in war-time. The most interesting features are the statements of the percentages and the discussions of the causes of increase of crime, especially of juvenile crime; among which are mentioned the demoralizing effects of hating one's national enemies, the excessive excitement of the imagination by the events of the war, decrease of adult control due to the absence of the soldier father or older brother and the increased occupations of the mother, decrease of teachers, of police supervision, of scout leaders and club workers, increase of wages, of drunkenness, among both men and women, of temptation, of war books which augment the already over-great excitement, darkening of the streets, etc. It is urged that all the preventive and constructive agencies be exercised to the utmost in this crisis.

Crafts (9) publishes a bibliography on the subject of the relations of crime and feeble-mindedness, of which the majority of the titles are from English and German sources and include the topics; crime in general; Binet tests of criminals; other tests of criminals; and recidivism. Porteus (24) reports the results of giving his own series of tests to juvenile delinquents and Australian aboriginal children. The latter did considerably better on the whole than did the former.

A number of investigations have been made of the mental condition of the inmates of workhouses, prisons, reformatories, etc. Haines (16) measuring by the Yerkes-Bridges point scale the mentality of eighty-seven prisoners committed in sequence to the Ohio Penitentiary, finds that seventeen score below sixty-six points and that the remaining prisoners, while they do not appear to be feeble-minded, show a great many character anomalies which are correctible. Gilliland (14) finds, in testing by the same scale one hundred inmates of the Columbus Workhouse, that the older prisoners are no more defective than the younger ones; that the negroes do more poorly than the white prisoners; that there is a high correlation between the school grade attained and the mental age of the prisoner; that the average mentality of the workhouse prisoners is lower than the average of the penitentiary prisoners, although 30 per cent. of the former are above the penitentiary average; and that there is not a wide variation in the average mentality of the prisoners who have committed one kind of crime as compared with those who have committed another kind. Pintner and Toops (23) report a mental

survey of the population of a workhouse undertaken by group tests and individual tests. They found that the median mental age of the 132 cases tested by the former is 9.25. They classified these cases on the basis of both the former and the latter tests as follows: 29 per cent., feeble-minded; 29.5 per cent., borderline; 31 per cent., backward; and 10.5 per cent., normal. They also found that a fairly close agreement existed between the mental age and the school grade, although there were a few notable exceptions of men of good mentality with very little school training; and, finally, that the different kinds of misdemeanors are represented by men of all levels of mentality. Bowler (5) studied seventy-five girls of the Ohio Girls' Industrial School. She concludes that the state must face the following facts: A certain percentage of its girls are so defective as to be quite incapable of self-management; time, money, and effort are being wasted in an attempt to reform this type; and finally these girls are prolific and, if returned to society at twenty-one years of age, will bear offspring who will become likewise a social burden. She urges mental clinics. An investigation by Ordahl (22) of delinquents who were wards of the juvenile court of San Jose finds that 45 per cent. of the minor delinquents examined are feeble-minded and that, if the borderline group is added, 60 per cent. are subnormal; that 60 per cent. of the parents of these minor delinquents are either alcoholic, immoral, feeble-minded, or insane. The author recommends sterilization and urges the establishment of suitable institutions for the high-grade feeble-minded and the working out of a system by which would be insured the detection of children in the first ten years of life who are bound to become wards of the state and to reproduce their kind, who will in turn become state burdens. Similar measures are urged by Thatcher (25) who presents, as arguments, the important features of several cases, such as a white slave case, the cases of a young woman forger, a dangerous prostitute, several murder cases and so on. Williams (28) gives a brief sketch of twelve family histories which indicate the extreme importance of heredity in delinquency. Undoubtedly much of our delinquency can be accounted for by the perpetuation of degenerate and tainted stock. An obligation rests upon society to see that such children are not born. It must not be overlooked, however, that defective endowment and defective environment go together, thus doubling the forces that make for delinquency; and also that, even in feeble-minded children, delinquency is to a considerable extent a product of environment. Bingham (4) cites a

number of cases of young women who have been referred to Waverly House by the New York Probation and Protective Association and gives an account of the intensive examination of these women as arguments to hasten the time when to prescribe treatment for delinquents without first intensively studying them will be regarded as a form of legal quackery. Haines (17) in a study of thirty-three adult female offenders confined in the Ohio Penitentiary proposes, to the end of preventing the crimes of the feeble-minded and the increase of their kind, that they be reported by state supervisors to a central bureau which shall have the power to manage their continued guardianship in their homes or in institutions.

Keedy (19) reports a proposed bill which establishes a direct relation between criminal responsibility and mental disease. The bill takes account of the present view of the medical profession that there is no sharp line of cleavage between sanity and insanity; that mental unsoundness may be as varied in its forms, symptoms, and degrees as physical unsoundness. Thus, in court the expert witness shall not be called upon to state that the defendant is either sane or insane but only to state the symptoms of the mental disease; the judge shall describe these symptoms to the jury; and the jury shall decide whether the defendant had the particular mental state so described; that is, whether he had a criminal mind by reason of his disease, and shall bring in a verdict accordingly. Adler (2) urges that in every case of delinquency or social difficulty it should be determined whether the difficulty is due chiefly to inadequate intelligence, emotional instability, or paranoid disposition which involves mistakes in logical thought processes. The mental defectives cannot have their intelligence increased; the personality of the paranoid cannot be appreciably changed; but emotional instability can be controlled in varying degrees whether it occurs in the so-called emotionally unstable persons or in the paranoid or defective groups. To this end is needed a system of mental and emotional exercises for the purpose of habit-formation, that is, a system of "orthopsychics."

Adler (3) also urges the establishment of psychopathic laboratories in connection with criminal courts; that such organizations must have large elements of elasticity so that they can be adapted to changing needs and to newly discovered facts, for the methodology of such laboratories is still largely experimental. The director should be a psychopathologist and should have a corps of workers to carry out the mental testing, the psychiatric and the physical

examinations, and the case history investigations. With the laboratory must be coördinated the probation, parole, social service, and education departments of the community. The laboratory should also have a detention home or ward where the individual offenders may be under observation for such a period of time as is advisable. Wallin (26) cautions us not to overwork the conceptions of feeble-mindedness, psychopathic constitution, and criminal irresponsibility, lest we destroy the recognition so far secured of mental incompetency as a criminal factor; and he urges us to suspend judgment pending the accumulation of further experimental data. We must realize that there is a large zone bordering the fields of feeble-mindedness and insanity which has as yet not been scientifically defined. Fernald (12) emphasizes that at present the problem of a clearing house for criminals is a rigid experimental trying out of diagnostic tests for distinguishing between the feeble-minded and the normal and for further determining the degrees of feeble-mindedness. In illustration she gives a table which shows that the same group has from 34 per cent. to 100 per cent. of feeble-minded according to the standards employed by such different scales as the Binet-Simon, the Goddard revision, the Stanford revision, the Yerkes-Bridges point scale, etc. Haines (16) also points out the significance of this discrepancy among the various standards. Crafts and Doll consider the problem of determining the proportion of mental defectives among juvenile delinquents. Part 1 (10) and Part 2 (11) are already published. Parts 3 and 4 are to follow. The series is intended to constitute a critique of the present status of the subject.

Brown (7) discusses the existence of mental conflicts, making for anti-social conduct, which are produced in the environment of the narrow-minded home.

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PSYCHOLOGY AND THE WAR

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Among the various problems discussed in British, French, and American literature on the psychology of the war, two are particularly prominent: the nature of the impulses that prompt men to fight, and which of these in particular have prompted the German nation to provoke the present war. Russell (13) says that the present war has in the main grown out of impulses of aggression and resistance to aggression, rather than intelligent calculation. Martial impulses have had their way because opposing impulses, such as love, constructiveness, the joy of life, and the artistic and scientific impulses, are too weak. In turn he criticizes the various social institutions connected with property, education, marriage, and religion for defects that prevent the natural expression of impulses. If impulses could receive natural expression wars could be avoided. McLaren (8) finds some manifestations of hatred for its rivals in each European nation, but shows that such hatred has been most reduced to a system in Germany. Lissauer's "Hymn of Hate" is typical of a great deal of recent German literature. Fisher (5) thinks that one cause of the war has been the rise of nationalism. Though not so important in France as in some other nations, it has been developing. Since Déroulède's *Chants de Soldat* in the 70's, the soldier has been glorified, and a sentimental love of the soil of France has developed. In philosophical literature intellectualism has waned, and the vital impulse has been exalted. Hall (7) thinks that the war has confirmed the reversionary theories of Freud, Pfister, and Patrick, and that it is more or less normal for man at times to lapse back into primitive emotion and the life of the troglodytes. In war there is a tendency to mechanize human activity and suppress individual initiative. This is easier to effect in autocracies than democracies. "War is as necessary for a monarchy as peace is for a democracy." The German "superman" is an iridescent dream evolved to compensate the nation for their over-institutionalized life. Marshall (9) attacks the doctrine that wars at times are moral necessities. This rests on the fallacy of assuming that states are moral personalities, whereas they really are "mere aggregates of individual personalities who have common traits and common aspirations."

Pugh (11) regrets the cowardice of warfare, which extinguishes true sportmanship and fair play in the treatment of the enemy. He attributes this cowardice to "that secret spirit of racial hatred which neither civilization nor religion has hitherto been able to eradicate from human nature." Bird (2) gives a digest of literature reporting the mental states of the soldier from the time that he leaves home until he is actually engaged in battle. There is a complete mental readjustment to a new environment, in which individual self-assertion and the disposition to reflect or criticize disappear, while obedience becomes a matter of course. In the collective mass fear largely disappears, at least from consciousness, and courageous actions are done with little self-consciousness. Many of the higher attitudes degenerate, and there is a return to more instinctive and racial modes of behavior. R. H. (12) on the contrary, writing from personal experience, reports much that is morally fine in military discipline. This, at its best, rests upon a just exercise of authority on the one who gives orders and a firm feeling of obligation on the part of the one who receives them. A nation proves its right to live when its army, constituted of its citizens, and organized without distinctions of class and rank, is animated by such a spirit. At the summit of the national life there are no more chiefs and soldiers but consciences and wills directed toward the same ideal and submissive to the same rule. "It is equality of duties in community of sacrifices that makes the equality of men." Wells (16) finds the instinctive bases of the sort of pacifism that refuses to rally to the support of one's country to be: first, the instinct of "self-abasement" (adapted from McDougall and conceived to be in harmony with the "*régression*" of Ribot), which opposes the instinct to self-preservation with pacifism, as it opposes the sexual instinct with prudery, and the economic instincts with glorification of poverty; and, secondly, the opposition of the various pleasure-seeking, familial and economic instincts to the instinct of self-sacrifice for the group.

Several French writers point out certain defects in the German national consciousness. Gérard (6) shows that, although the term *Völkerpsychologie* comes from Germany, that Germans have utterly failed to understand the sentiments and ideals of any of the other European nations, either in diplomatic relations prior to the war, or in the conduct of the war itself. Wagner's (15) article is an illustration of similar blindness in the treatment of the populations of Alsace and Lorraine. Boutroux (3) maintains that the Germans,

with individual exceptions, have never, in spite of their scientific progress, been able to appreciate the spirit of what other nations mean by civilization. Commencing largely with Fichte, a philosophy of history has developed among them that makes their own state the expression of the divine Idea supreme above all norms of truth, justice, beauty, and humanity and bound to dominate everything. Perrier (10) similarly argues that survivals of old mythological and magical conceptions combined with national egotism have given a presumptuous and irrational character to German science and philosophy. Bergson (1) finds that a time came when the Germans gave up the possibility of a more rich organization from within of freely associated wills and personalities to accept an externally imposed system of mechanical unification easier to acquire rapidly and offering complete organization and swift success. Deonna (4) and Verneau (14) enumerate a variety of ancient and primitive superstitions that have reappeared during the present war. The appearance of colossal statues in wood of Hindenburg and others in German cities is the recrudescence of superstition highly developed among savages and still surviving among peasants in continental Europe. Renewing one's vows of loyalty while one nails one's prayer into a fetich or an image of a hero or saint materializes it, and makes it physically effective.

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SPECIAL REVIEWS

An Introduction to Social Psychology. C. A. ELLWOOD. New York: Appleton, 1917. Pp. xii + 343.

In this book, offered as an introduction to social psychology and to the social sciences in general, Ellwood has brought up to date, simplified, and systematized the content of his earlier volume, *Sociology in its Psychological Aspects*. The book is moreover enriched by well-chosen references placed at the end of each chapter. It will meet the class-room need of many teachers better than any other text.

Identity of title might tempt one to compare this book with that of Wm. McDougall. Comparison is nevertheless hardly possible, for the latter is an introduction in the sense of preparing one for the study of social psychology, while Ellwood's volume actually introduces one to that science. It is of some interest to note that McDougall's book is the work of a psychologist who has turned to the study of social science, while Ellwood is a sociologist who looks to psychology for an explanation of his problems. It is particularly gratifying to the professional psychologist to find a sociologist as well informed on matters psychological as is the author of this book. Its most distinctive value arises precisely from an adequate combination of sociological and of psychological knowledge.

Considerable space is devoted to a defense of the thesis that as the "psychic element" is the "constituent principle of social life," therefore psychology is the key to the mysteries of social life (see especially the preface and chap. I.). To have kept for many years this proposition before students of sociology, is one of the conspicuous services rendered them by our author. It is not maintained that there exists in society no factor other than the psychical (see his table of active factors, p. 76), but the hereditary, the geographical, and the economic factors are regarded as exerting their action on society through the psychical. "The explanation of social phenomena is to be sought in the underlying traits and dispositions of the individual, in the influence of the environment which acts upon his plastic nature, and in the resultant aims and standards which he develops (p. v).¹

¹ A fuller statement of Ellwood's position together with critical remarks will be found in this number of the BULLETIN under the heading *Methods and Principles in Social Psychology* (p. 367).

In the chapters on "Organic and Social Evolution" and on "Human Nature and Human Society," two main theses regarding the origin of the human mind and its nature are set down: (1) The appearance of the mental life, both in its instinctive and intellectual aspects is the result of variations, selected because of their superior utility in bringing about control of the organism over its physical and social environments. (2) Human nature is not passive, it is active and selective. It organizes by "taking up from the environments whatever it needs in order to aid it in adapting itself to its surroundings" (p. 53). In using these propositions as fundamental working hypotheses for social psychology, the author is, we think, in agreement with the best thought of the day.

When Ellwood affirms that the distinctive feature of man's social life, compared with animal associations, is to be traced in the main to his higher intellectual development, he may seem to maintain the intellectual theory of social life. That, however, is not his meaning, for he holds that "the social development which we find in humanity is, in principle, the same as the social development which we find in animal below man." Instinct and other innate tendencies are therefore for him, as for McDougall and most present-day authors, the more fundamental social factors.

The central part of the book (pp. 79-187) treats of the nature of social unity and continuity and of social change. We regret that space does not permit us to follow the author in his interesting treatment of these topics.

In the following three chapters he returns to the action on the social life of instinct and of intelligence, and discusses imitation, suggestion, and sympathy. Two other chapters treat respectively of social order and social progress. In the first are discussed the means of social control, *i. e.*, government, law, religion, and morality. In the second, the anthropo-geographical, the biological or ethnological, the economic, and the psychological theories of progress are considered and set aside for his own theory, called "sociological." He holds that in order to formulate an adequate theory of social progress, we must transcend the strictly psychological viewpoints. "The sociological theory of progress must find a place for favorable physical and geographical conditions, the biological factors of heredity and selection, the economic factors of the production and distribution of wealth, and the psychic factors of knowledge, standards, and emotional attitudes" (p. 309).

The final chapter reviews the three great historical theories of

the nature of society: the contract, the organic, and the psychological theories. He accepts the last, but only when broadened so as to include all the psychical elements in human behavior and even "biological conditions and forces." Thus understood the psychological theory furnishes a basis for the synthesis of other theories. It is set forth in these words; "The explanation of human social life is to be sought in the underlying traits and dispositions of men, in the influences of the environment which act upon their plastic natures, and in the resultant aims and standards which they develop. The social process, according to this theory, is not purely subjective but is psychic only in the sense that its significant elements are psychic. More strictly, as we said in an earlier chapter, the social process may be described as a psycho-physical process of coadaptive adjustments among individuals" (p. 322).

Many readers will no doubt wonder why the theory of social progress that finds favor with the author is called the "sociological" theory, and is thus distinguished from the "psychological" theory which he rejects, while the theory of the nature of society he accepts is called "psychological." Whatever conflict there may be here, is, I think, merely a verbal one.

A book of moderate size, covering as wide and as complex a subject as social psychology, and assuming something of a critical, historical point of view, *i. e.*, undertaking criticisms of theories new and old, cannot pretend to thoroughness. But the author has written the particular kind of book he wanted to write—one that will undoubtedly contribute to the advancement of our young science—and it is not for the reviewer to say that he should have devoted his talent and knowledge to the writing of another kind of book.

The reader will not fail to realize that these pages are written by one not only delighting in the theoretical consideration of social life but guided by the warm hand of reality. He believes that "social psychology is vitally related to human life and destiny" (288). The breadth of his sympathetic vision appears in utterances such as this: "from the standpoint of social psychology the most important element in human progress, after the development of reason, is the development of a humanity-wide sympathy and good will. . . . Rationality and good will must go together in any well balanced progress that is to remain stable." (p. 262).

JAMES H. LEUBA

Social Rule, A Study of the Will to Power. E. C. PARSONS. New York: Putnam, 1916. Pp. 185.

In her latest study Mrs. Parsons attempts the interpretation of our present social order through use of the Nietzschean formula, "The Will to Power." She finds that many social classifications, not a few social formulas, and most of the relations between classes can be explained from this point of view. It is not so much the love of money, or the craving for economic goods, as it is the love of power which explains the existing institutions and the order of society. Mrs. Parsons disclaims any ethical purpose in her analysis; but one cannot escape the impression that she wishes to drive home, what she evidently believes to be true, namely, that existing institutions are the result of the arbitrary imposition of the will of one-class upon another. This is, of course, the general thesis of revolutionarism. It does not seem to occur to her to think of the social group as a functioning unity, which like a football team, in its efforts to act as a unity, must divide its labor and so divide itself into classes. No one would think of attributing the position and the functions of "full backs," "half backs" and "quarter backs" to the arbitrary will of the captain! Social groups under normal conditions, it is safe to say, are much more like football teams than like groups of conquerors and subjects, ruled by the will to power and the fear of power, as Mrs. Parsons implies.

CHARLES A. ELLWOOD

Outline of Applied Sociology. H. P. FAIRCHILD. New York: Macmillan, 1916. Pp. x + 353.

The publishers announce this book as "a guide to the study of modern social problems rather than a series of conclusive sociological discussions." It is a study in social pathology and will serve excellently as a text for elementary classes along that line. The book is divided, after a brief introduction, in which the author discusses the classification of social phenomena and the concept of social abnormality, into three principal parts: one discussing the abnormal aspects of the economic life; another, the abnormal aspects of population growth, marriage and the family, migrations, and child life; and another, the abnormal aspects of the esthetic, intellectual and spiritual life.

While there is little use made of psychology in the book, it is sensibly written and if one takes it for what it purports to be, an "outline" for the study of the subjects of which it treats, one could scarcely ask for a better text.

CHARLES A. ELLWOOD.

Social Psychology. Questions and Readings in Social Psychology.
E. S. BOGARDUS. Los Angeles: Univ. of Southern California.
Pp. 30.

This is a brief and helpful, but inadequate, syllabus for a course in social psychology.

CHARLES A. ELLWOOD

Philosophy and The Social Problem. W. DURANT. New York: Macmillan, 1917. Pp. x + 272.

This is an interesting book conceived on broad lines. Its purpose, the author tells us, is to show, first, that the social problem has been the basic concern of many of the greatest philosophers, a proposition familiar to all students of the history of social theory; second, that the approach to the social problem through philosophy is the first condition of even a moderately successful treatment of the problem. By philosophy, however, the author says he understands "a study of experience as a whole." Moreover, he adds "that science flourishes and philosophy languishes, because science is honest and philosophy sycophantic, because science touches life and helps it, while philosophy shrinks fearfully and helplessly away. If philosophy is to live again, it must rediscover life, it must come back into the cave, it must come down from the 'real' and transcendental world and play its venturesome part in the hard and happy world of efforts and events." To this conclusion the sociologist and social psychologist will take little exception. The author proposes that philosophy approach the social problem through a new and inductive method, to which proposition again, there will be little objection. One expects him to add, seeing that he has studied under Dr. Dewey, that the approach to the social problem must be chiefly through social psychology, but this he fails to state explicitly though he would perhaps agree.

CHARLES A. ELLWOOD

The American Indian. An Introduction to the Anthropology of the New World. C. WISSLER. New York: D. C. McMurtrie, 1917. Pp. xiii + 435.

This is an indispensable book for the social psychologist who wishes to keep abreast of the work in modern anthropology. As the author says it is "a general summary of anthropological research in the New World," almost encyclopedic in character. Not

only has it the ordinary chapters on the distribution, classification, and historical development of the various aboriginal peoples of the New World; but also very valuable chapters on their material traits of culture, their fine arts, and their social traits. Finally, two chapters are devoted to theories of culture origins in general and New World origins in particular. In these latter chapters the author sets forth the historical and pattern theories of human culture which have now come to be most widely accepted by scientific anthropologists. Very rightly, Dr. Wissler says, that the culture of any primitive or uncivilized people is not to be interpreted any differently than the culture of an historical, civilized people, say, such as the English. He fails to recognize, however, that even the culture of an historical people is to be understood in its development only in terms of social psychology.

CHARLES A. ELLWOOD

The Psychology of the Great War. G. LeBon. (Trans. by E. Andrews.) New York: Macmillan, 1916. Pp. 480.

The Great War has produced very little unbiased scientific literature dealing with its causes. LeBon's book is not an exception to this general statement. There is nothing detached in its point of view. Moreover, it is far from modern in its psychology. It makes light of the idea that commercial rivalry had much to do with producing the war, but finds its main origin in the illusory ideas held by Germany of her national destiny and superiority.

The book might perhaps be commended as an antidote to a too exclusively economic view of the war, but its psychology is in mystic rather than in rationalistic terms. Too much is made of the "mystic, collective forces" of the "national mind." Like all of LeBon's writings the book is written in a fascinating style.

CHARLES A. ELLWOOD

The Psychology of Religion. G. A. Coe. Chicago: Univ. of Chicago 1916. Pp. xv + 365.

This book is fittingly described by the author as "primarily a handbook for beginners in the psychological analysis of religion." It could not properly have been called a handbook of the psychology of religion. Professor Coe is one of the very few professionally equipped writers in this field. He enjoys the further distinction of being moved by a more than scientific interest; "the religious enterprise" is to him "the most important undertaking in life" (p. xii).

That this and, I would add, his professional connection with a theological seminary have not warped his psychology, is his claim; which I, for one, readily admit. His book is as thorough a piece of scientific investigation as the nature of the subject permits. I must, however, be permitted to deplore the ambiguity of the terms in which he expresses his relation to Christianity: "I entertain as my own, in short, the Christian faith in divine fatherhood and human brotherhood" (p. xiii). My objection to the use in this connection of the term "divine fatherhood" is not that it cannot be taken in a sense fitting his point of view, but that much of the definite historical meaning it carries is repudiated by him. It is therefore likely to mislead those who seek authoritative support for antiquated dogmas.

A main characteristic of this book is an extensive comparative consideration of the structural and functional points of view in psychological investigation, and a consistent effort to treat separately structural and functional problems. The more essential problems refer to the purposes and ideals that we strive to realize; they are functional problems. The psychology of self-realizations or of selves "is psychology *par excellence*" (p. 19).

As the analysis of the functional activity of the mind constitutes the core of the book, it must receive here fitting consideration. What connection there is between it and religion will appear later on. Human action discloses a consciousness of ends or of values. The ends that we seek to attain may be described as preservation, completion, unification, and organization of values. It is an obvious fact that men are ever criticizing and reconstructing their standards. There is here operating what Coe calls "a law of social valuation."

"This phase of evolution is, on the one hand, mind's increasing discovery of what it wants to do, and therefore of what mind really is. On the other hand, this discovery goes forward through conflict with what we are. Purposes, as contrasted with impulses, and the increasing organization of life through ideas, are achievements. They require the redirection of old desires, and redirection involves resistance. . . . Human nature, then, is not merely a current that flows by reason of the law of gravity; it has also the peculiar property of resisting and redirecting its own flow. If, now, we could determine what is resisted, and what is the direction of these redirections, we should thereby formulate laws of functional evolution" (p. 221).

That this creative process has reference to persons in social relations, that organization of desires and purposes progresses parallel with the discovery of the self regarded as a social unit, and that the higher values are social values, are truths repeatedly and forcibly presented to the reader. "The whole evolution of mind is discovery . . . ; we are discovering ourselves through the reintegration of our wants, scientific and other, in terms of personal-social self-realization" (p. 244). "The evolution of social valuations is a progressive discovery of persons as reals; that intense valuation of persons, when it becomes reflective, tends to define itself in terms of a cosmic reality that has social character. What we have here is nothing less than a law of mental integration" (p. 245). "Whenever one takes an absorbing interest in any particular thing or enterprise, one idealizes it, organizes other interests about it, and thus finds one's real world partly by having a share in making it real" (p. 324).

So far, with a restriction to be noted below, we find ourselves in hearty agreement with the author. In bringing to the fore the purposive, creative, integrating aspect of conscious life and its essential dependence upon the social relations, Coe has rendered a service to the psychologists whose work is too often an implicit denial of the existence of the chief fact of which a functional psychology should take account.

The stricture we would make refers to the affirmation that the personal-social integration "has no parallel in chemical or neural structure" (p. 299). The denial of a conditioning relation between the organizing activity of the mind and the activity of the nervous system, involves the most far reaching consequences. It may be a valid speculation; but it is certainly not one within the field of psychological analysis.

The idea we have discussed runs through the whole book; it forms its conceptual background. Almost every chapter is made to contribute something to its presentation or demonstration. It is, however, mainly to Chapters IV, XIII, XIV and XV (Preliminary Analysis of Religious Consciousness, the Religious Re-valuation of Values, Religion as Discovery, Religion as Social Immediacy) that the reader should turn for enlightenment on this fundamental issue.

But what has the selective and integrating action described above to do with religion? The author can be quoted as affirming that it "is religion" (p. 244). In the Preliminary Analysis of Religious Consciousness, it is declared that "any reaction may then be con-

sidered as religious to the extent that it seeks 'life' in the sense of completion, unification, and conservation of values—any value whatever" (p. 70). (See also p. 72.) And on page 235 it is written, "religion is a law of mental evolution in accordance with which wants tend to be reintegrated in terms of personal-social self-realization;" and again, a little further on, "the modern social movement, where it is most reflective, is religious" (p. 243). If these utterances were to be literally construed; if, *i. e.*, humanity's strivings toward a fuller and more perfect life—whatever the means employed and the form assumed—were regarded by Coe as religion, then I should have to disagree altogether.

The present tendency to resolve religion into something which would claim the entire approval of all, is highly significant of the defensive position into which existing religions have been forced. Who would not wish to be called religious if religion were adequately described, as some claim it is, as "the consciousness of the higher social values"? But if any "socially minded person" is religious, and if one may properly speak of the "religion of democracy, of art, of science," etc.; then, had we not better discard the word "religion" and be content to use the more specific terms, social values, democracy, art, science, etc.? That use of the word "religion" involves, I hold, an arbitrary extension of its historical meaning until it becomes synonymous with the central tendency of social life itself. The preservation, unification, and integration of values is coextensive with social and not only with religious life.

But, despite appearances, we are not at liberty to consider the above quotations as expressing the author's conception of religion. Early in the book he warns us that his "present problem is not to say what all men ought to mean when they use the term 'religion,' but rather to indicate the direction of attention or the organizing idea that is at present most useful in the psychology of religion" (p. 62). And, on page 229, he characterizes the immanent movement we have described as "the most significant mark in religion—at least the most interesting for us." The reader should therefore make due allowance for any expression he may encounter that would make it appear that the author is attempting adequately to differentiate religion from the rest of life. His chosen task, as I understand it, is really to draw attention to the creative force manifested in social life, both within and without religion. Thus, instead of being concerned with that which characterizes religion as a separate type of human activity, he singles out and considers a factor—the most important factor—common to all forms of social life.

In my opinion, as I have said at length elsewhere, it is only when human strivings toward the preservation and increase of that which is valued follow along a specific channel; or, in other words, when the fulfillment of life's purposes is sought by certain specific means, that we have that particular mode of behavior called religion.

If I mention finally a group of chapters on the origin and development of religion, and another on special problems, such as conversion, mental traits of religious leaders, religion and the subconscious, mysticism, the future life as a psychological problem, prayer, I shall have indicated, if very insufficiently, the wide scope of the book.

The successful effort of the author "to provide, particularly in the alphabetical and topical bibliographies, convenient apparatus for following up problems, and especially for setting them in a scientific perspective" (p. ix), deserves notice and commendation. The chapters are brief but substantial and in many parts original, and they all bear witness to an intimacy with religious life—in whatever sense the term be taken—and to an acuteness of psychological understanding which give to this volume a distinctive place in the literature of the psychology of religion.

JAMES H. LEUBA

The Belief in God and Immortality. A Psychological, Anthropological and Statistical Study. J. H. LEUBA. Boston: Sherman, French, 1916. Pp. xvii + 340.

In an earlier work, *A Psychological Study of Religion*, Professor Leuba gave an account of the origin, the function, and the future of the belief in "personal gods." The present volume is a similar study of the belief in "personal immortality," including closely related material on the belief in a "personal god." By "personal immortality" the author means "a continuation after death (with or without body) of the consciousness of personal identity" (pp. viii, ix.) A "personal God" would be one with whom direct intellectual and affective relations can be maintained (p. ix), *i. e.*, "a God to whom one may pray in the expectation of receiving an answer," this last implying "more than the subjective, psychological effect of prayer" (p. 225). The conceptions as thus defined are declared to be fundamental to all the historical religions, including Christianity and Judaism, but excepting primitive Buddhism and Comtism.

The book is divided into three parts. In the first of these an

effective contrast is drawn between the "primary belief" in immortality—held by primitive men without a desire for it, and simply consisting in a fear of ghosts forced upon them by what appear to be patent facts—and the "modern belief" in a state of blessedness—which had a wholly different origin and was motivated by "the desire for the realization of ideals." A number of interesting interpretations are advanced in this connection, noteworthy among which is the distinction between the "ghost" which begins its career with a person's death, and the "soul" which exists before birth and is "the (individualized?) life-power possessed by every object that, in the eye of the savage, is animated" (p. 71). Two historical chapters argue for the origin of the "modern belief" in ancient Greece and Israel in independence of the "primitive belief." The two concluding chapters of the first part maintain the inadequacy of the arguments for immortality based upon metaphysics, inner experience, and psychical research.

The second part reports the results of a statistical investigation of the prevalence of the beliefs in a "personal God" and "personal immortality," as above defined, among American scientific men and college students. The questionnaires were carried on with great care and thoroughness, and this portion of the book deserves the study of all interested in possible methods for the investigation of the prevalence of beliefs in contemporary society. Four questions were submitted to and replied to by *all* students in classes of the non-technical departments of "nine colleges of high rank" and "two classes of a normal school," 1,100 answers being obtained. 56 per cent. of the men students and 82 per cent. of the women students were found to believe in a "personal God." In "one college of high rank and moderate size" in which 90 per cent. of all the students replied to a questionnaire, the believers in "personal immortality" constituted 80 per cent. of the freshmen, 76 per cent. of the sophomores, 60 per cent. of the juniors, and 70 per cent. of the seniors. Two identical investigations were made, each including 500 names chosen at random, from the list of 5,500 names in *American Men of Science*. It was found that 42 per cent. believed in a "personal God," and 48 per cent. were disbelieving or doubtful, while 51 per cent. believed in "personal immortality" and 49 per cent. were disbelieving or doubtful. The questionnaire was also sent to names similarly chosen from the membership lists of the American Historical Association, the American Sociological Society, and the American Psychological Association. Comparing special-

ists in different fields the proportion of believers in a "personal God" diminished in the following order: historians, 48 per cent.; sociologists, 46 per cent.; physicists, 44 per cent.; biologists, 31 per cent.; psychologists, 24 per cent. The proportion of believers in "personal immortality" was: sociologists, 55 per cent.; historians, 52 per cent.; physicists, 51 per cent.; biologists, 37 per cent.; psychologists, 20 per cent. In every group the believers were much less numerous among the men who had previously been designated in an impartial manner as the more "eminent." Though the attempt was made, no unambiguous replies could be obtained from philosophical men for a variety of reasons. The author finds that disbelief, both among scholars and students, is not so much due to technical knowledge directly bearing on these subjects as to traits of independence and self-affirmation, and to greater freedom from social pressure.

In the third part the author advances "certain weighty facts" to show that at the present time, at least among the most civilized nations, the beliefs in a "personal God" and "personal immortality" as defined, do not possess the utility usually ascribed to them. Among these facts the following may be mentioned. The replies to the questionnaires show that a large percentage of cultivated persons do not desire "personal immortality," while an equally large percentage are only moderately desirous of it. The fear that the disappearance of these beliefs would work moral injury is ill founded. At present they have very little force as moral sanctions. Moral ideals and moral energy, on the other hand, have their source in social life. Moral education can better be effected through a clear recognition of the natural consequences of actions than through formal religion. These beliefs have an injurious effect in promoting "other-worldliness."

The reviewer wishes to express his dissent upon three points. (1) Though the general distinction between the two beliefs in immortality seems well established, the author does not give enough recognition to certain motives to belief in immortality that are common to the two. The desire to give and receive aid and sympathy from the deceased is such a motive. One does not need to be a specialist in these matters to recall the presence of such motives among Melanesian and African savages. The ancestral and hero worship of ancient Greece and Rome and modern Japan show the presence of this motive on the higher levels of the "primitive" belief. Catholic adoration of saints and prayers for the dead and both Catholic and

Protestant moral reinforcement from belief in the aid of the risen Christ and the sympathy of the church triumphant belong within the scope of the "modern" belief. (2) The author shows that beliefs in a "personal God" and "personal immortality," as he has defined them, have surprisingly little vital hold to-day upon the types of people included within his statistical investigation. In other words, these beliefs, as defined, are losing ground among persons independent enough not to accept popular beliefs as a result of social suggestion and who have not had the opportunity or inclination to investigate these questions for themselves. Philosophers, the only type of thinkers included in the questionnaires, who do give serious consideration to these beliefs from the standpoint of metaphysics—the only discipline in the present state of human knowledge adequate to consider their verity—were unable to assume either the naïve attitude of credulity or the only slightly more critical attitude of incredulity requisite to reply to the questions with a simple Yes or No. In the reviewer's opinion, there is a considerable amount of truth in both of these doctrines, and he believes that in the course of another generation, after this truth shall have become adequately formulated and well known, that these beliefs in their reconstructed forms will again become vital in religious life. Of course he is here only opposing his own personal opinion to that of the author. He does so merely in order to show that it is quite possible to interpret the results of the author's research on this point in another way than that favored by the author himself. (3) The reviewer does not believe that the beliefs in a "personal God" and a "personal immortality," as defined, are fundamental to modern Christianity in the sense that their abandonment would involve either its disappearance or its transformation into something unrecognizable (p. 173). In fact, he believes that the psychology of religion has now taught us that no dogma can be said to be fundamental to any religion, mistaken as its adherents may be in thinking the contrary.

The author has made a number of noteworthy contributions, among which are the distinctions between two types of immortality, differing in origin, nature, and function, and the first really trustworthy information on the actual status of the beliefs in a personal God and personal immortality among certain classes of contemporary American society.

WILLIAM KELLEY WRIGHT

DISCUSSION

THE BELIEFS IN GOD AND IMMORTALITY

In the review of my book in this issue of the *BULLETIN*, Professor Wright expresses dissent from the author upon three points. The following remarks will help, I hope, to bring us nearer a solution of the problems involved.

I. Although my critic admits the reality and the importance of the distinction I have drawn between the primary and the modern belief in immortality, he thinks that I emphasize unduly their difference when I describe it as "radical" with regard to origin, nature, and function. In his opinion, I do not "give enough recognition to certain motives" that are common to these two conceptions, for instance, the wish for a continuation of a sympathetic relation with the departed.

In the first chapter of my book, under the subheading, "The Life of Ghosts and their Relation to the Living; the Primary Paradise" (pp. 15-23, especially 19 ff.), I described, briefly it is true but quite definitely, the presence among savages of this very motive which is undoubtedly a prominent one of the modern belief. In a general way, one may affirm that whenever in primitive life the hereafter is pictured as desirable, *i. e.*, as a paradise, motives of the kind of those to which the modern belief owes its existence have been at work.

That which I wished to convey with particular emphasis was the radical separation existing between the primary belief in its final form—the form it assumed at the end of its historical development in the countries from which our civilization arose, namely Egypt, Palestine, Asia Minor, Greece, and Rome—and the modern belief. In all these countries, the hereafter was pictured as the abode of inactive, ineffective, and unhappy shades, with whom the living maintained no affectionate relation. Only repugnance or dread was felt by the living for the fate in store for them. The hero worship of the Greeks belongs, I think, to another strand of belief from the one with which I was concerned.

It is hardly an exaggeration to describe as "radical" the difference existing between that ancient belief and the one which arose

in those very countries in disregard or opposition to the primary belief. I did not, however, deny the influence upon the new belief of survivals of the old. On the contrary, I drew attention to that influence. I wrote, "but, if these two conceptions of continuation may not be regarded as possessing a common origin, they existed side by side for many centuries. Even today, there are Christians who believe in ghosts" (pp. 124-125).

2. Regarding the second point, I must say that I find it impossible to join issue with the reviewer; his criticism is not specific enough. "There is a considerable amount of truth in both these doctrines," he writes with reference to two conceptions of God, one of which is the one I presented to my correspondents. But what is the other? If there be any virtue in my investigation, it is in great part because I have dealt with one specific aspect of the God-belief and defined it in behavioristic terms. I inquired as to the belief in a God who, according to the traditional understanding, may be appealed to with the expectation of being heard and, under definite conditions, answered. Everything else was irrelevant to my purpose. I chose this and not other aspects of the God-idea because it seemed to me not only implied in, but necessary to all forms of existing religions—I do not say to every possible conception of religion. The books of worship of every organized religion testify to a belief in the existence of that particular relation with God. This belief does not necessarily imply an anthropomorphic God, but it surely implies an anthropopathic God.

The failure of the *questionnaire* with the philosophers, is not to be accounted for on one ground only; I stated or hinted at several in my discussion of their attitude toward the investigation. My own conviction, as it results from my correspondence with the philosophers and from whatever personal acquaintance I may have with some of them and with the writings of a larger number, is that had the questions been formulated so as to involve, in their understanding, only that which I desired to involve, their answer would have confirmed the generalizations I made on the basis of the answers received from other groups of men, namely, that the particular form of the relation with God in which I was interested seems destined to become rarer in proportion as knowledge and moral qualities that make for eminence in scholarly pursuits increase (Chapter X, pp. 282-288; see also p. 281).

The thing for the reviewer to do if he wishes to meet the issue raised in Part II is to "adequately formulate" the reconstructed

belief to which he refers, so that we may see how far it is consistent with the form of worship which came into existence thousands of years ago and which, so far, has characterized all organized religions; namely, the personal direct address to a being with whom man believes himself in immediate intellectual and affective communication.

How the "truth" regarding the existence and the nature of God is to be established, is a question with which I did not venture to grapple. But if belief in the traditional God of the religions be affirmed as "true," and if it be claimed further that he makes himself known in specific actions upon man, then I hold that his existence is a proper object of scientific investigation (see Chapter XI, "Theology and Psychology" of my earlier book, *A Psychological Study of Religion*).

3. When Professor Wright affirms that the psychology of religion has taught us that "no dogma can be said to be fundamental to any religion," I am not sure that I understand him. To say that the disappearance from the Christian religion of that particular relation between God and man upon which my investigation bears, would so profoundly alter that religion as to make of it a new religion, is to use the terms "new" and "religion" in no other sense than that commonly given to them when one speaks, for instance, of Christianity as a *new* religion, and of Mahommedanism and Christianity as two different *religions*. How much of a change warrants a new name, is a question as to which it would be difficult to come to an agreement.

JAMES H. LEUBA

REJOINDER TO PROFESSOR LEUBA'S ANSWER TO WRIGHT'S CRITICISM OF HIS BOOK

1. Professor Leuba's reply to my first criticism concedes most of what I had in mind. I agree that he has established a "radical difference" between the two types of belief in immortality. But it still seems to me that at least one motive—the desire for a sympathetic relation to the dead—is common to the two types, and I wonder if this motive may not have assisted in effecting the transition from the "primitive" to the "modern" belief. If so, there has been some continuity of motivation in the evolution of beliefs in immortality.

2. My statement, "There is a considerable amount of truth in both these doctrines," was misunderstood by Professor Leuba.

It does not refer to two doctrines of God, but to the doctrines of a personal God and a personal immortality.

To formulate adequately the reconstructed beliefs in God and immortality is in my opinion one of the great contemporary tasks in the philosophy of religion. I hope in time to be able to contribute "my bit," and am working on the problem. Much light has been furnished by such books as Andrew Seth Pringle-Pattison's *The Idea of God in the Light of Recent Philosophy*, W. E. Hocking's *Meaning of God in Human Experience*, James Ward's *Realm of Ends*, Josiah Royce's *Problem of Christianity*, and Bernard Bosanquet's two sets of Gifford Lectures on the Individual. Acceptance of the principal conceptions advanced in any of these books would be compatible with active and sympathetic relationship with most Protestant churches at the present time. Though these books make anthropomorphic conceptions impossible, they really conserve and give deeper significance to the doctrines of a personal God and personal immortality—at least so it appears to me. A philosopher who held such conceptions would find it difficult to reply to Professor Leuba's questionnaires. He would be in the predicament of a student of recent biological literature if asked to reply to the following statement by either "Yes," "No," or "Am in doubt": "I accept the theory of evolution set forth in Darwin's *Origin of Species*."

3. Doctrines appear to me to be merely symbols by which religious experiences are interpreted. The Christian experience is in most respects the same, whether stated in Pauline or Nicene or Calvinistic or Unitarian symbols. It is older than any of these symbols and may outlast them all. Similar statements might be made in regard to any of the other great spiritual religions. It is reasonable to suppose that the beliefs in a personal God and a personal immortality, in the precise forms in which they are defined in Professor Leuba's questionnaires, might in time be entirely replaced by profounder conceptions without fundamentally altering the general character of Christian experience.

WILLIAM KELLEY WRIGHT

DARTMOUTH COLLEGE

THE
PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

PSYCHOLOGICAL EFFECTS OF DRUGS

BY A. T. POFFENBERGER, JR.

Columbia University

A number of books and articles have appeared during the last year giving a popular review of the facts concerning the effects of alcohol. One of these by Fisk (4), medical director of the Life Extension Institute, presents the results of a study of insurance data concerning the "risks" of users and non-users of alcohol. The physiological effects of alcohol and its relation to human efficiency are also summarized. Bowers (3) gives a popular account of the experimental and statistical studies of alcohol. He includes a chapter on "Alcohol and War" and one on "Alcohol and the College Man." Both of these chapters are composed largely of opinions of leaders in the two fields rather than experimental data. Hollingworth and Poffenberger (6) give a resume of the effects of alcohol and various other drugs on efficiency. Miles (8) repeated the experiments of Dodge and Benedict (*Psychological Effects of Alcohol*) upon one of their subjects. Tests and procedure were duplicated as nearly as possible. The results confirm the findings of Dodge and Benedict. "The two series of measurements taken together unmistakably indicate as a result of a dose of 30 c.c. of absolute alcohol a lengthened reflex latency with a decrease in the amplitude of movement, slower reactions, slower coördinated movements, less sensitiveness to stimulation and an increase in pulse rate. The memory and word reactions, as in the earlier results, were improved after alcohol."

Stockard and Papanicolaou (9) treated guinea pigs with alcohol

fumes and studied the influence of this treatment upon the descendants for four generations. They report that when males are treated and females are normal, the offspring for four generations show defects of various kinds, limited in most cases to abnormalities of the central nervous system and sense organs. The inherited conditions must be due to changes produced by the alcohol inhalation in the germ cells, or in their chromosomes. This work should be of considerable interest to students of mental defects. Bagg (1) measured the effects produced by the inhalation of alcohol fumes upon habit formation in white mice. The maze was used for testing learning power, and 24 hours always intervened between maze trial and alcohol treatment." Animals that had previously made normal records, without the alcohol treatment, were found to make slower average records when the treatment was instituted, and in like manner, . . . when the alcohol treatment and the maze learning were begun at the same time the daily records were again inferior to those of the control group."

Macht and Isaacs (7) studied the effect of some opium alkaloids on the psychological reaction. Twelve subjects were tested, the drug was given by injection and control doses of saline solution were employed. Simple reactions to light, sound and touch, and association reactions consisting of the solution of addition and multiplication problems were measured. Morphin doses varied from $\frac{1}{16}$ to $\frac{1}{4}$ grain (the latter being an ordinary therapeutic dose). The smallest dose produced a period of stimulation as indicated by a shortened reaction time, decrease in mean variation and reduction in the number of errors. This was followed by a period of depression. The larger the dose the shorter the stimulation period became, until with the largest dose it was extremely brief. "From the experiments made with combinations of morphin with other opium alkaloids . . . it appears that morphin given in such a form is more narcotic and correspondingly more depressant to the psychic functions than when the same dose of morphin is administered to the same subject by itself."

Berry (2) measured the effect of smoking upon the mental work of addition. The tests were all made upon himself and nothing comparable to the control doses, considered so necessary in other drug work, were possible. The experiment was continued for 20 days, and on alternate days the subject smoked one cigar. On smoke days the work was done in 7.7 per cent. less time and with slightly fewer errors than on non-smoke days.

Goddard (5) reports an experiment on the effects of pineal gland extract upon mental development. Three subjects, two of the Mongolian type, who were fed the extract for a period of 6 months to one year showed no improvement.

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REACTION TIME

BY V. A. C. HENMON

The University of Wisconsin

Evans (2) reports a comprehensive study with trained and untrained subjects of light, sound and touch distractions on simple light, sound and touch reaction times. Distractions uniformly lengthen the times, both with trained and untrained observers, and increase their relative variability. Practice causes an early period of rapid adaptation but the effect of distraction is never completely overcome. Light distraction was most effective at the beginning but waned rapidly. Sound was, on the whole, somewhat more effective as a distraction than light or touch. A warming up period characterized both the series with and without distractions. The distraction effect was greater when the distraction and main stimuli belonged to the same sense. Training acquired by long practice with one stimulus seems to be transferred bodily to another stimulus. Training in reaction with distraction shortens the reaction very

definitely to a different stimulus with the same distraction. Training in reacting without distraction does not appreciably aid in reacting to the same stimulus with distraction. Practice in reacting with a certain distraction does shorten the time of reaction with a different distraction. Training in attention, which means training in ability to ignore non-essentials for the sake of essentials with the accompanying attitudes of self-confidence, self-reliance and interest in the work, make transfer possible.

Austin (1) reports a new method of elimination of the variable errors in "making" and "breaking" of electrical connections where electro-magnet is used. His method is "based on the fact that the arc produced by an alternating current between two electrodes is set up and extinguished twice during each cycle of alternations and also upon the accuracy with which the frequency of an alternating current may be indicated and observed by employing a so-called Frahm frequency meter." The image of the alternating arc, whose frequency is readily determined, is focused upon a moving photographic film. The number of dashes is counted and serves as a basis for measuring reaction time.

Warren and Reeves (3) describe an ingenious arrangement which permits all switches and the chronoscope to be operated by one experimenter. The apparatus, while not regarded as ideal, has been found effective for simple reaction to sound and light and for association reaction to normal stimuli.

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SPECIAL REVIEWS

An Outline of Psychobiology. K. DUNLAP. Baltimore: Johns Hopkins Press, 1917. Pp. 145. (2d edit.)

The present edition of this useful book might well be described as a "corrected" edition. The changes are mainly those of corrections and of slight additions to make matters more readily understood by the beginner. A glossary of terms has been added and the

pronunciation of terms is given in it instead of in the index. The use of plates borrowed from different sources, with different names for the same structures, is continued. This may tend to familiarize the student with several names for the same part, but it is perplexing. The adaptation of the figures could have been made at little expense, and this procedure would have prevented much possible confusion. At the same time the relative sizes of the figures should receive more attention. Some are reduced to an extent which makes them difficult to read, and there is a disproportion in emphasis (compare, for example, Figs. 3 and 78). The psychologist has the right to demand from the publisher as great legibility for the figures in a text as for the type.

The book has been previously thoroughly criticized on the anatomical side and further reference to this aspect is needless. The physiological and the psychological aspects have received less attention. Many physiological statements are scattered throughout the book, and Chapter IX is given up to the physiological-psychological views of the author regarding "the functional interrelations of receptors, neurons, and effectors" in which the relations of the nervous system to "consciousness" are considered. This chapter may well take our attention. The main points which are made are as follows:

All normal physiological processes are reflexes and accessories to reflexes. There is also an "I" or an awareness. The awarenesses are of different kinds, all depending "upon the action of reflexes," some being perceptual (including feelings) and others being thought. The latter are "not initiated in the same receptors" as the perceptual, although the characters of the reflexes are not differentiated beyond saying that they have "the same termini" as the reflexes giving rise to the perceptual awareness. There is no neurological distinction between "reflex" action and "voluntary" action, since all normal actions are the termini of reflexes. Discharge from an afferent neuron may take place along many efferent channels, or the same efferent neuron may be affected by impulses starting from any one of the numerous afferent neurons. When, however, a certain afferent neuron is stimulated it may affect a special set of efferent neurons connected with muscles which produce a predetermined movement. Other efferent elements are also set in activity. In addition, the effectors used for the special activity receive impulses which have originated not in the first afferent neuron but in other afferent elements "not definitely

analyzed." The predetermined reflex (for example, an eye to finger reaction) is the dominant one and "the condition of dominance and subordination is probably typical of the reflexes which condition perceptual consciousness." On the other hand, "the essential condition of attentive consciousness seems to be the functioning of the nervous system as a whole." In the production of serial habits, such as two or more reactions following one stimulation in place of two or more serial stimuli, "the efferent current resulting from the first will be drained into the afferent current of the second, thus setting up an actual arc between the two muscular activities. . . . A long series of reactions, each of which originally depended on a separate stimulation, may become serially connected and follow accurately from the stimulus of the first one. If each link in the chain is 'conscious' . . . the repetition of this series is associative thought; and its formation is the association of ideas." Thought is conceived to depend upon the irritation of muscular receptors, but in certain cases this is unnecessary and it is believed that "the reflexes are short-circuited, *i. e.*, that the efferent current eventually starts an afferent current without descending to the muscle level." Perceptual habits, circular reflexes, and the interrelations of reflexes and consciousness are also dealt with.

Much of this is neither elementary nor obvious. It is almost entirely speculative, although written mostly as if the expressed views recounted discovered facts. Speculation, as such, is not to be condemned, but in a book that purports to give to the student "morphological and physiological data" directly contributory to psychology, it might have been well to label the chapter distinctly as "a theoretical or speculative discussion of the relations of consciousness to neurological and other bodily activities." Many students would then take less literally the views which are expressed. They might also be tempted to add data from physiological and clinical fields which do not always accord with the speculative explanations of the experimental results on habit formation (including the psychology of skill) which have apparently been well read by the author.

Some of the theoretical difficulties are surmounted by the author's refusal to accept the "all or none" law for nervous tissue. His tacit assumption that an efferent neuron may act to stimulate directly an afferent neuron (quoted above) also makes the speculative treatment more simple, even if it thereby throws doubt upon the whole of the author's hypothesis. The failure to include any facts re-

garding habit formation in relation to the activities of the nervous system should be corrected in any subsequent edition of the book. The absence of any satisfactory discussion of the facts or data regarding the reflexes, upon which much of the speculative discussion hangs, is also unfortunate.

There is a section on the use of the term "center" as applied to different parts of the nervous system which may be commended to the careful consideration of all neurologists, psychiatrists, physiologists, and psychologists.

SHEPHERD IVORY FRANZ

GOVERNMENT HOSPITAL FOR THE INSANE

Sex Hygiene. F. H. GERRISH. Boston: Gorham Press, 1917. Pp. 51. 60 cents.

This booklet contains the lecture given many times by Dr. Gerrish to college boys. It may appeal to a few readers but its main appeal must have been due largely to the talking personality of the author.

SHEPHERD IVORY FRANZ

GOVERNMENT HOSPITAL FOR THE INSANE

Rational Sex Ethics. W. F. ROBIE. Boston: Badger, 1916. Pp. 356. \$3.50.

As a physician dealing with nervous and mental disorders Dr. Robie has had the opportunity to obtain the sexual histories of many patients, and in this book they are utilized as occasion demands. The returns from a questionnaire to normal (and other) people are also included, and the sexual habits, the sexual feelings, etc., of a number of individuals are described. Extracts from popular teachings are given, some are criticized adversely and are justly estimated, while others are praised. The mawkish and religious books which flood the country are deprecated, as being unscientific even though their object may be praiseworthy. The suggestions on bibliography are good for those who desire to know some of the best that has been written and who are not interested in the subject from a personally morbid craving for the salacious.

While there is nothing new of a psychological, physiological, or sociological character beyond the case histories, the book may be recommended to those who desire information, more scientific than that contained in the pages of some of our dailies and other periodicals and in those of the religio-scientific books. It should, however, be stated that what is provided is too strong food for the adolescent and for the sexless prude.

SHEPHERD IVORY FRANZ

GOVERNMENT HOSPITAL FOR THE INSANE

REPORT

REPORT OF COMMITTEE ON REEDUCATION RESEARCH

Following is a report of the efforts of the Committee on Reeducation of the American Psychological Association, and of the similar Sub-Committee of the Psychology Committee of the National Research Council. The report is published, in accordance with the custom of other similar committees and sub-committees, to show the progress that has been made up to the present time.

Immediately after the publication of the report of the Conference on Reeducation held under the auspices of the General Medical Board of the Council of National Defense (see the *BULLETIN*, 1917, 14, 229), much general and special medical and other scientific interest was manifested throughout the country. Inquiries regarding various aspects of the problems were received from individuals, from representatives of local and national organizations, and from teachers. Definite questions were answered as well as the chairman could, and suggestions were made when requested. Much of this interest could be called sporadic, or scattered, there being apparent no inclination to look at the whole, but rather local or individual problems and needs to be suggested or solved.

Requests for suggestions regarding investigations were, however, made by three individuals representing national and general aspects of the work: by Major Edgar King, M.C., U.S.A., for the Office of the Surgeon General of the Army; by Mr. Charles H. Winslow, Assistant Director in charge of Research of the Federal Board for Vocational Education, for that Board; and by Dr. Stewart Paton, of the War Work Committee of the National Committee for Mental Hygiene, for that Committee.

Memoranda were prepared and sent for the purpose to each of these with the following results. Dr. Paton acknowledged the receipt of the memoranda (dated September 20), reporting that he had referred them to Major Pearce Bailey, M.R.C., U.S.A., the chairman of the War Work Committee. No action has been reported to date by Major Bailey. The memoranda (dated September 18) written for Mr. Winslow were acknowledged, but information of further action has not been received. Major King, to whom the memoranda were given on September 17, requested more definite information and suggestions, which were furnished in subsequent memoranda. The further progress in this direction will be noted below.

All three memoranda were in the main alike, but differing in slight details on account of the special interests involved. They pointed out the necessity for the investigation of certain problems of reëducation, with special reference to those matters which may be called "functional restoration" or "functional adaptation." They suggested that investigations in these lines, at least from the medical aspect, were to be considered on a par with investigations of pathogenic bacteria, curative sera, and the like. From the educational side it was suggested that certain methods be investigated in order to discover those giving the best results with adults having different maiming conditions. Such investigations, it was pointed out, are necessary in order "to save time, to reduce expense, and to bring about the best results" in functional recovery of the maimed and crippled.

The investigations most urgently needed are those which are planned to discover methods to better (if possible) the following conditions: (1) those disabling accidents which at present are considered to be incurable or for which no functional adaptation is recognized, and (2) the most frequently encountered accidents which are now dealt with in a way, but for whose betterment it is recognized that methods of improved technique should or may be devised. Investigations of these kinds, it was suggested, could very well be prosecuted in this country with cases of industrial accidents, which resemble closely those of war, and many cases of these industrial accidents would be available for study in such large commercial and industrial centers as Boston, Chicago, and New York. It was also pointed out that in the published reports from England and France which were examined the fact had frequently been deplored that time or men had not been available for the investigations of methods, and it was suggested that investigations in this country should be inaugurated immediately in order that our maimed and crippled soldiers might have the benefit of any improvement in technique or of newly devised therapeutic measures. The inauguration of such investigations in this country, and provision for their temporary prosecution, it was pointed out, would be advantageous in other directions, in that the work could be done by civilians. The preliminary investigations would also permit the determination and selection of the more capable men for further work, and nearer the firing line, if the continuation of the investigations was considered to be desirable.

On September 19, in conversation, Major King suggested that

any investigations should be conducted as near as possible to the Office of the Surgeon General, and that the work should be planned to be started in Washington, either at the Walter Reed General Hospital of the Army, or at the Government Hospital for the Insane where certain facilities for the conduct of the work were immediately available. He requested that additional memoranda be submitted to him in which detailed information be given of a few problems, of cost, and the like. This was done September 24, 1917.

Three problems were suggested: a comparative study of the paralyses, with reference to the effects of different procedures; a consideration of the anesthetics which at present are practically entirely neglected as far as treatment is concerned; and methods of bringing about new coördinations in amputated cases. The laboratory of the chairman of the committee was reported as available, but it was pointed out that Washington is not an industrial center and that until Army casualties were received in large numbers it might not be possible to make as good a selection of cases as would be desirable. This suggestion was also made as an item of expense since being already in Government work the chairman could devote time to such investigations without the necessity for special employment by the War Department. Three full-time and paid workers were suggested with the addition of an assistant and a clerk, such workers to be employed by the War Department in order that their full time should be devoted to the work. The time to be devoted to the investigations in the preliminary period was set at four months, this amount of time being considered to be necessary on account of the long processes involved.

In a letter dated November 12, 1917, in answer to a request for any information regarding the decision of the Surgeon General regarding the matter, Major King wrote that the memoranda "will receive attention and that it is the intention of the Surgeon General to make whatever investigations along the lines suggested by you as found to be possible. Up to the present time the matter has continued to be in a formative stage."

SHEPHERD IVORY FRANZ, *Chairman.*

GOVERNMENT HOSPITAL FOR THE INSANE

BOOKS RECEIVED

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- FREEMAN, F. N. *How Children Learn*. Boston: Houghton Mifflin, 1917. Pp. xiv+322. \$1.60.
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NOTES AND NEWS

THE November number of the *BULLETIN*, dealing with Social and Religious Psychology, was edited under the direction of Professor J. H. Leuba, of Bryn Mawr College.

PROFESSOR C. H. JOHNSTON, of the University of Illinois, was killed in an automobile accident on September 20.

DR. H. R. CROSLAND, of the University of Minnesota, has been appointed professor of psychology in the University of Arkansas.

PROFESSOR DAVID A. ANDERSON, formerly of the University of Washington, has accepted the headship of the department of psychology and education in the Pennsylvania State College.

PROFESSOR J. MARK BALDWIN has been appointed lecturer in the *École des Hautes Études sociales* at Paris

AT Swarthmore College Professor C. Fisher, of the West Chester State Normal School, and Professor S. B. Davis, of Ursinus College, will conduct the work in psychology and education.

DR. JOSIAH MORSE, of the University of South Carolina, has been granted leave of absence for the duration of the war to undertake Red Cross work in South Carolina, and to be field director of the work at Camp Jackson.

DR. T. L. BOLTON has been appointed professor of psychology at Temple University.

DRS. CARL ROSENOW and Jacob Kantor have been appointed instructors in the department of psychology of the University of Chicago.

THE University of Rochester has expanded its work in psychology, with a laboratory thoroughly equipped for experimental purposes, and quarters for animal experimentation. The work is under the charge of Professor L. A. Pechstein.

PROFESSOR L. WITMER, of the University of Pennsylvania, has sailed to undertake the direction of social service work under the auspices of the American Red Cross.

PUBLISHER'S NOTICE

OWING to the number of psychologists engaged in government work, and the consequent decrease in psychological investigations, it has been decided to suspend temporarily the publication of the *Journal of Experimental Psychology*. The publication will be resumed as soon as conditions warrant. Meanwhile the experimental material will be published in the *Psychological Review*.

PSYCHOLOGICAL REVIEW COMPANY

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